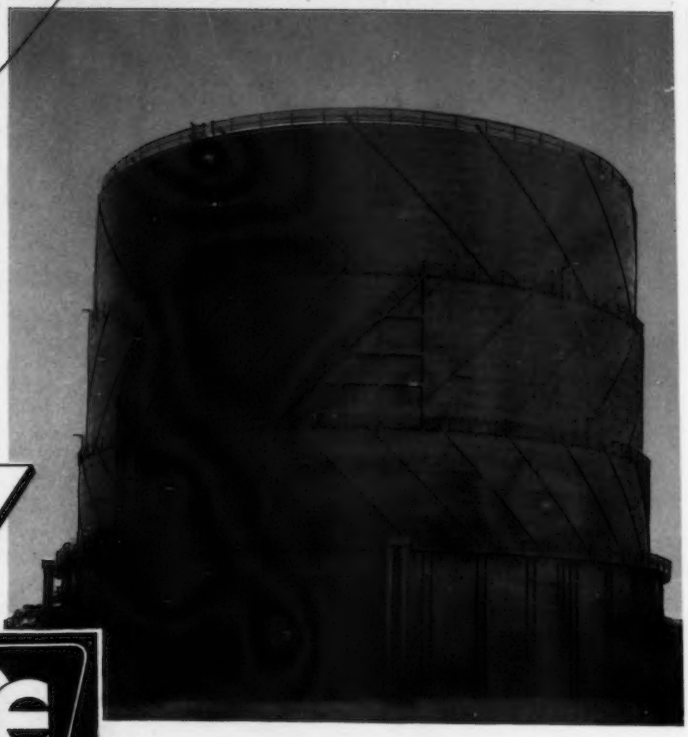
TECHNOLOGY DEPT.

Gas Journal

VOL. 289. 109th YEAR. LONDON, JANUARY 16, 1957. No. 4879 PRICE 1/6

2 RECENT CONTRACTS



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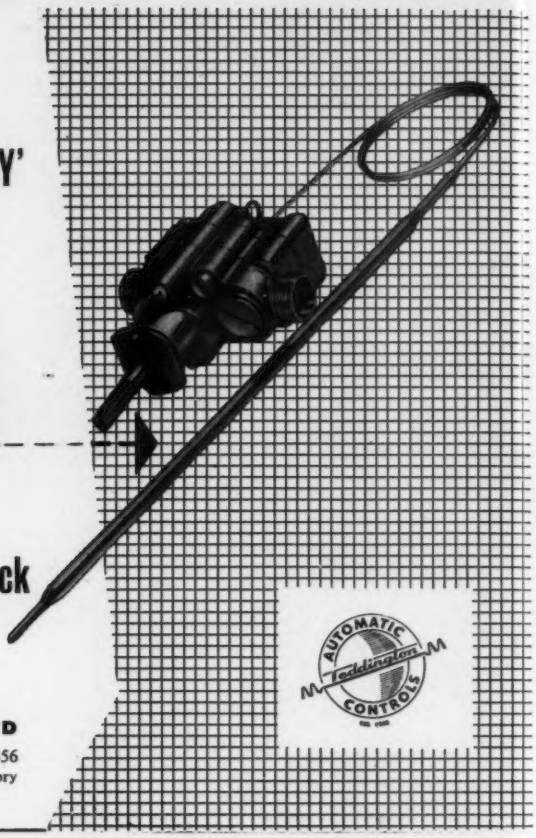

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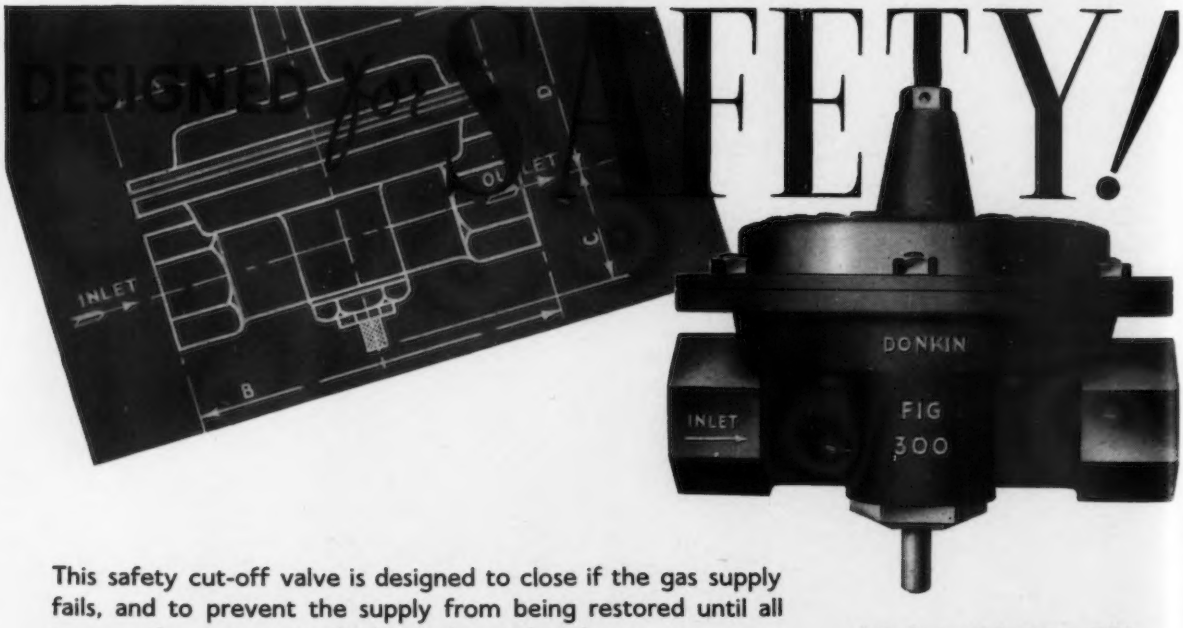

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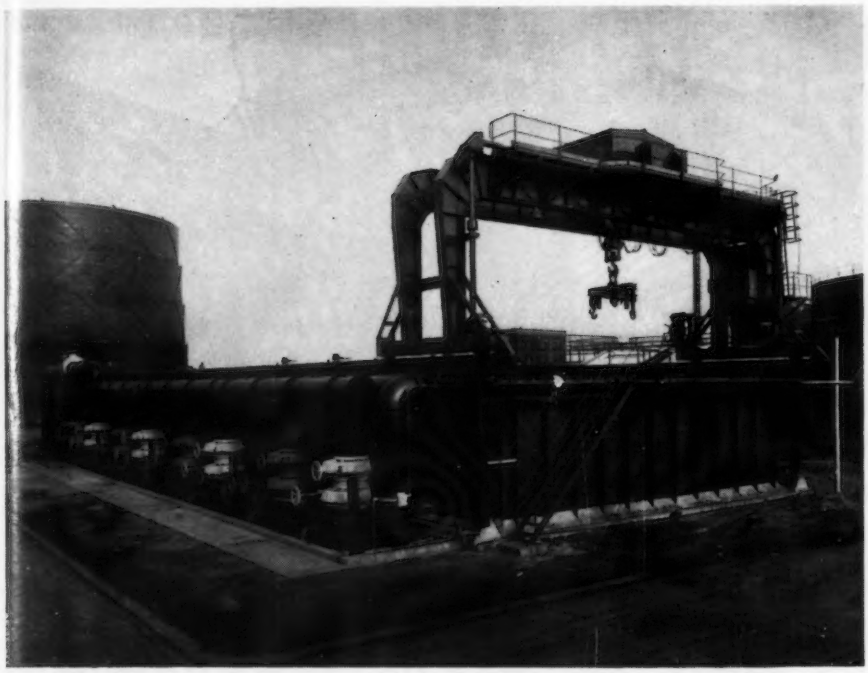

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The hallmark of high quality plant

(This illustration is by courtesy of the Southern Gas Board.)

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(Carr & Litler Patent No. 628338)

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are economically designed and can be shown to save those oxide handling costs which have long been accepted as inevitable in dry box purification.

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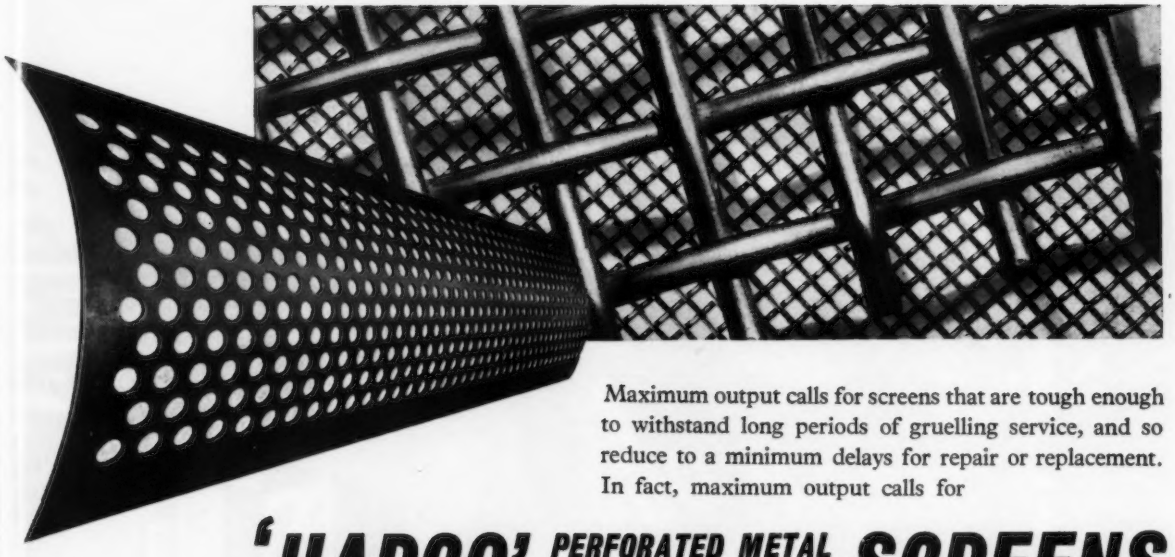

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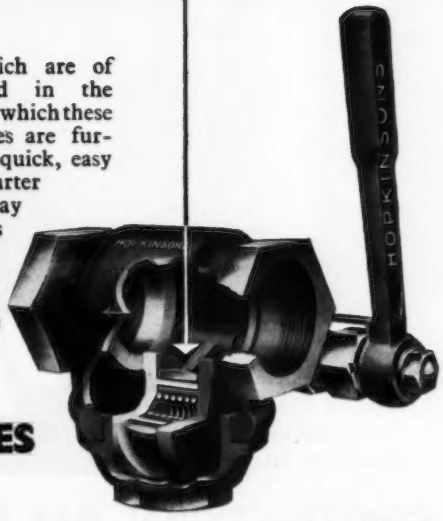

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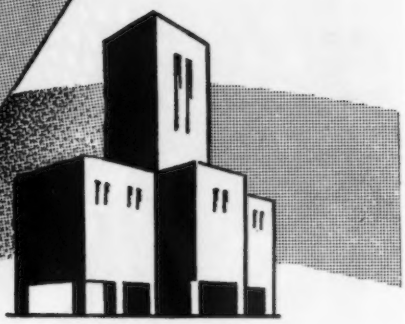

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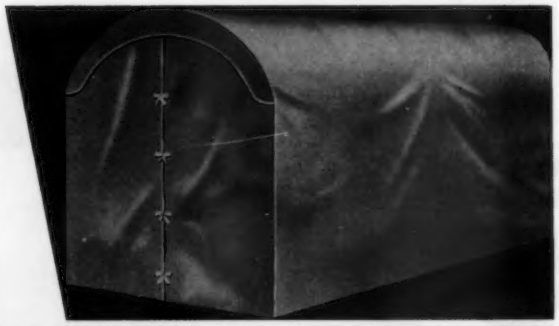

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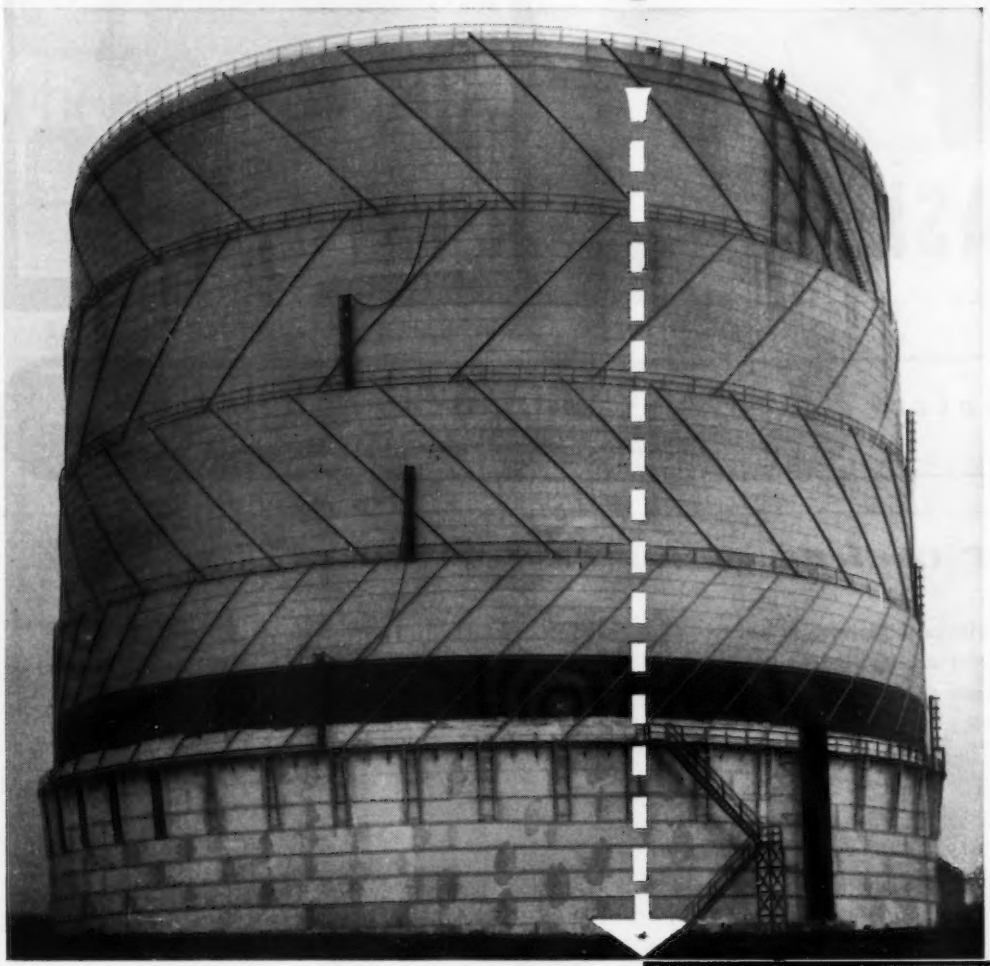

Coventry 6,000,000 cubic feet spiral-guided Gasholder. Photograph by courtesy of the West Midlands Gas Board and Ashmore, Benson, Pease & Co. Ltd.

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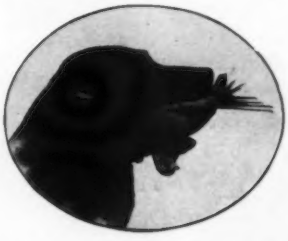
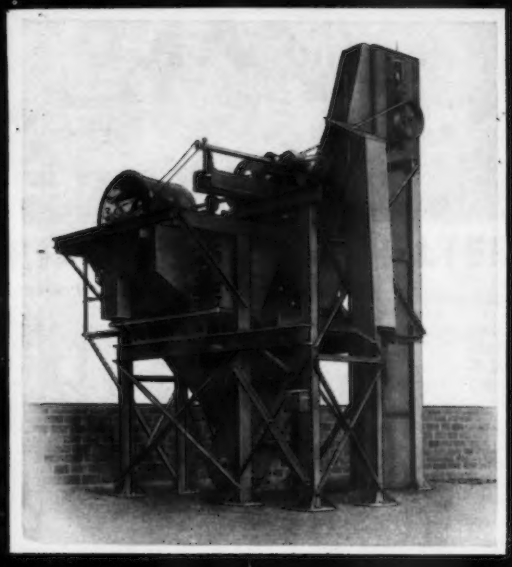
by the improved

"RETRIEVER"
(REGISTERED TRADE MARK)



WASHER



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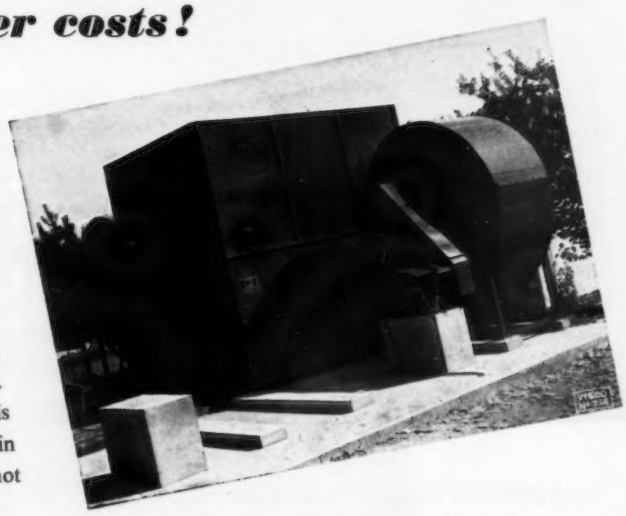
Cut your cooling water costs!

In many industrial establishments in which water is used for cooling, e.g., air-conditioning equipment, refrigerators, diesels, air compressors, etc., much water is wasted through being used only once and then run down the drain. About 97% of this water could be saved by installing a "Visco" Steelshell Water Cooler. With this the water used for cooling is re-circulated continuously, the only loss, a mere 3%, is due to evaporation. The reduction effected in water consumption is usually about 97%. These units can be placed in an odd corner, or, if space at ground level is not available, on the roof.



The photograph shows a "Visco" Steelshell Water Cooler recently supplied to The Marley Floor Tile Co., Ltd. The foundations for a similar unit are shown alongside. Sizes available from 250 g.p.h. Write for List No. 514.

VISCO
STEELSHELL *Water Coolers*

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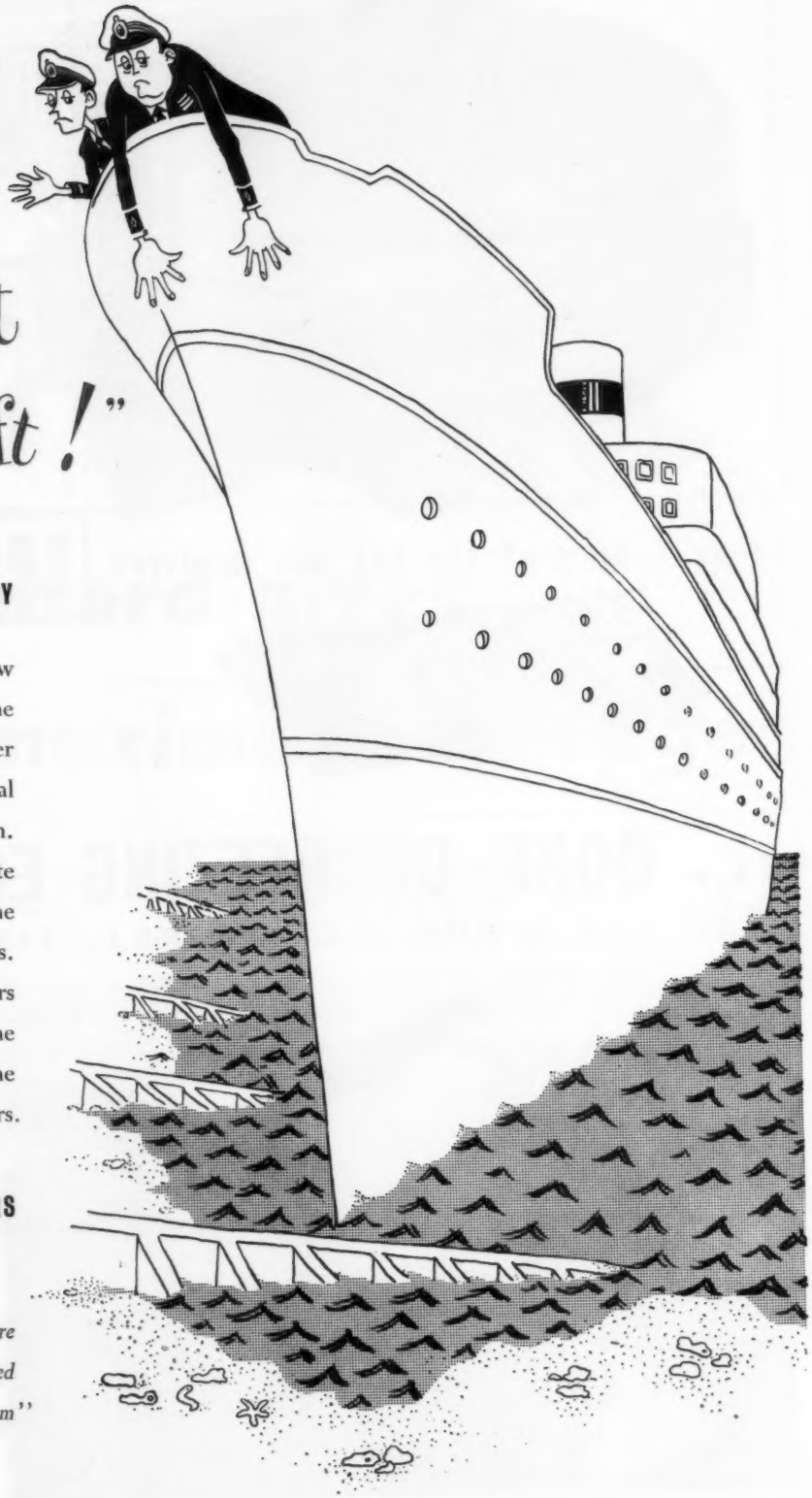
"The compass was right when we left!"



MAINTAINED ACCURACY

The measurement of a gas flow is an exact science, and the maintained accuracy of the meter depends upon the mechanical excellence of its construction. Revenue losses from inaccurate metering rise directly with the rising cost of coal to the gas works. So it is that dependable meters and a reliable repair service become increasingly important to the Area Gas Board and its customers.

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All pre-payment meters are fitted with the World-renowned "Smith's Mechanism"

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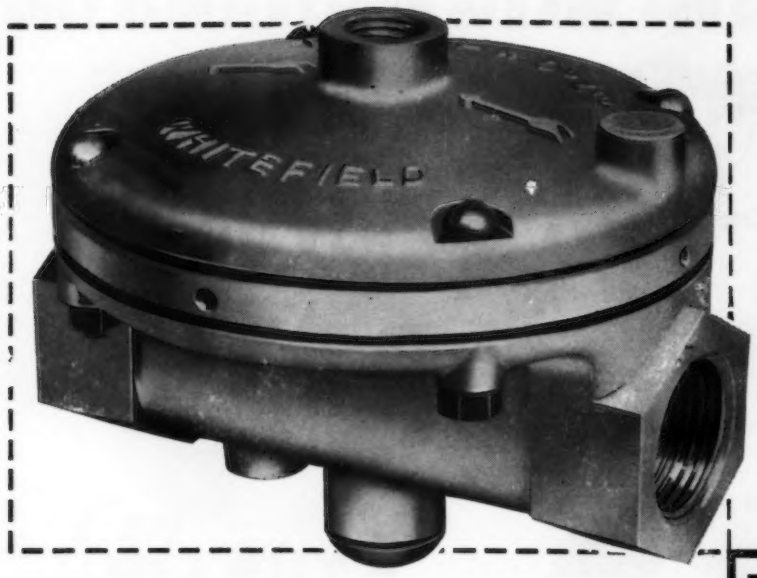

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- ★ Extremely reliable and economical

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FOR USE ON STEAMING EQUIPMENT

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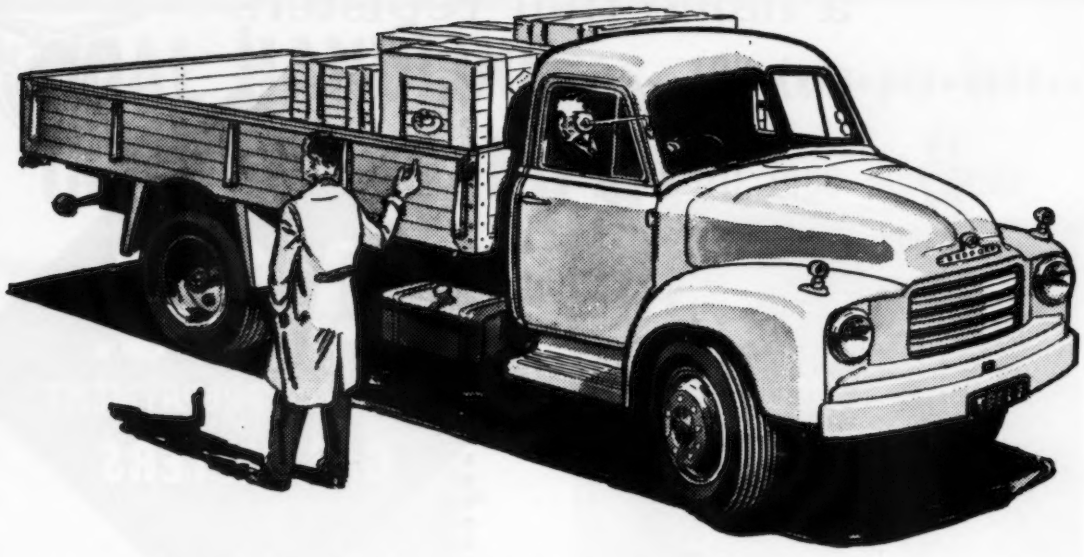

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More and more operators are changing to the Bedford 3-tonner with the Perkins P-4 diesel engine. They reckon that today, when fuel has to go further, the outstanding m.p.g. of this truck makes it the finest value on the road. And look at the ways in which this truck has been ' beefed up ': new heavy duty front axle with a load rating of 4,800 lb.; better vacuum servo-assisted brakes with a braking area of 314 sq. ins.; frame flitch plates as regular production option; heavier springs and tyres, 7.00-20 8-ply dual rear; gross vehicle weight increased to 6 tons 3¼ cwt. The Bedford 3-tonner is also available with the extremely economical Bedford petrol engine.

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Small case domestic—S.C.D

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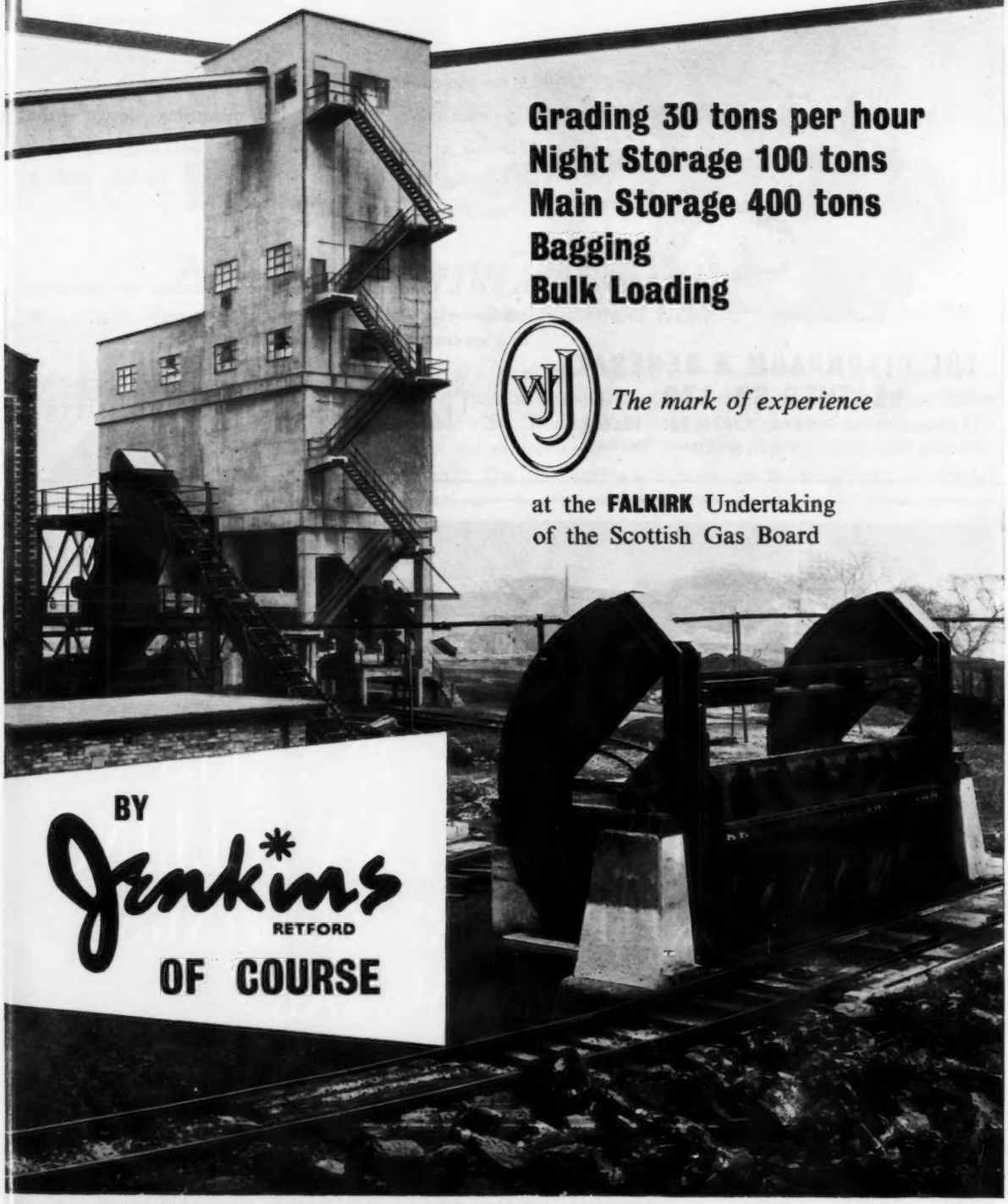

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measured breathing.....

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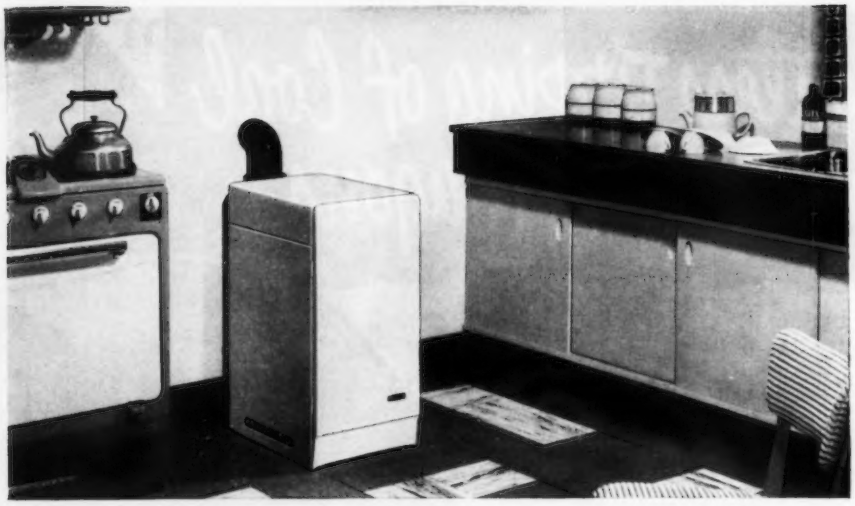
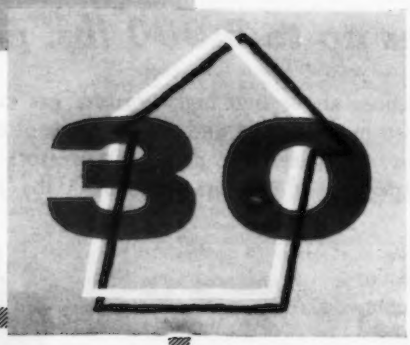


A year's full hot water supply in a three-bedroomed house for £18.12s.7d.

That is the actual cost (with gas at 1/4½d. a therm) of the operation of an earlier 'Potterton' 25,000 B.t.u/hr. model in the period October 1955—October 1956. The boiler is fitted with a clock control having a four tappet dial to provide an 'off' period during the day as well as during the night. The boiler serves a 40 gallon cylinder providing hot water for a bath, four basins, sink and washing machine. Consumption is approximately 300 gallons a week and the water is raised through a temperature of 80°F.

On these figures, the small gas-fired boiler is a really practical proposition for many householders. Clearly there is a ready market for the latest 'Diplomat' which combines with such performance and attractive design facilities for speedy, simple and inexpensive maintenance.



The 'Diplomat' Gas-Fired Boiler

A MODEL OF SELF-CONTROL

Available in white · cream scarlet and viridian green

THE DIPLOMAT GAS-FIRED BOILER

	Max. Gas Rate B.t.u./hr.	Max. Heat Output B.t.u./hr.
DIPLOMAT 30	40,000	30,000
DIPLOMAT 44	55,000	44,000

	Height	Width	Depth
DIPLOMAT 30	32⅛"	15"	27"
DIPLOMAT 44	32⅛"	15"	27"

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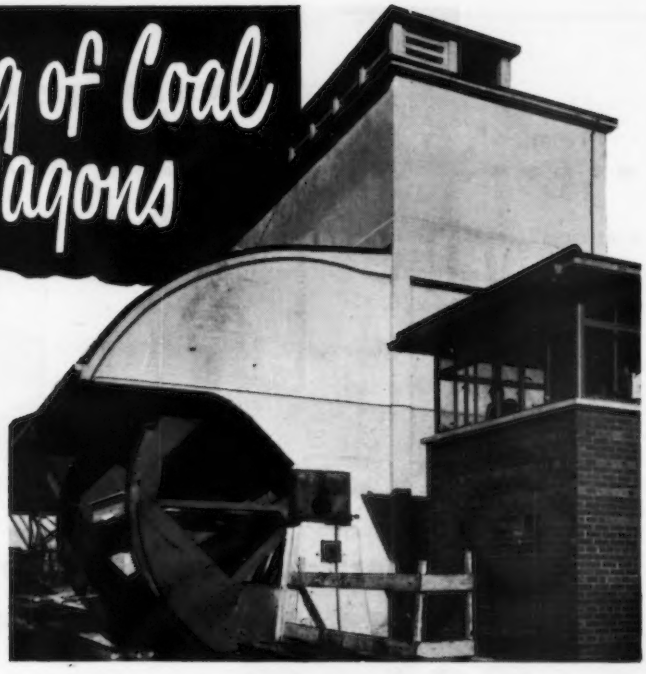
DLR 668

Dustless tipping of Coal from Railway Wagons



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ROTASIDE TIPPLER

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No Fans! No Filters!
Very little power required!

Full particulars from—

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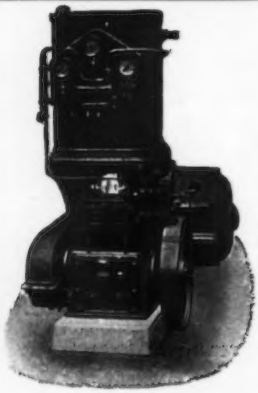

HIGH PRESSURE GAS COMPRESSORS *for*

pressures up to 5,000 lbs. per sq. in.

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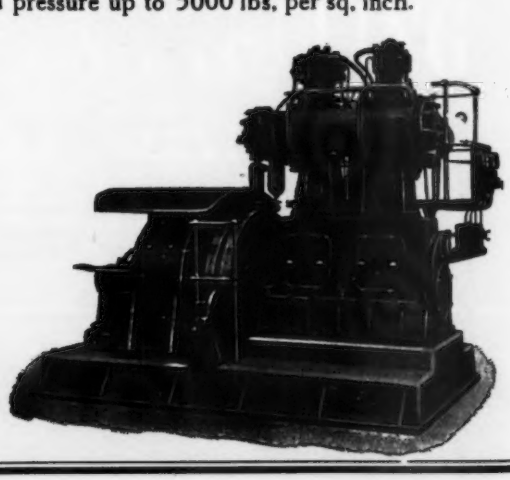

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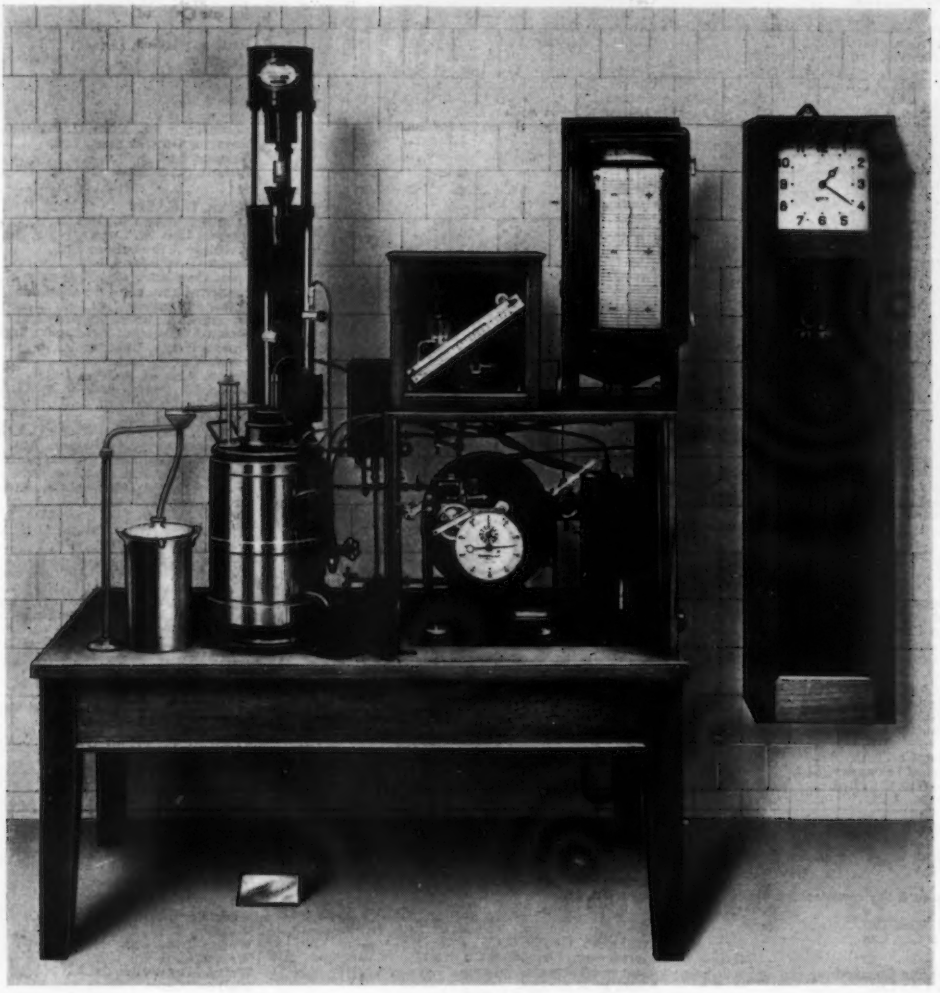

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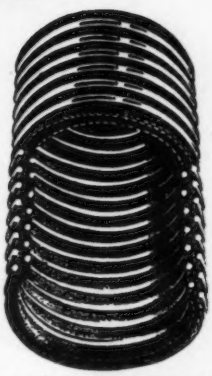

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Gas Journal

VOL. 289 *NO. 4879* *January 16, 1957*

109TH YEAR

MANAGING DIRECTOR: Clifford A. King

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Published by Walter King Limited,
11, Bolt Court, Fleet St., London, E.C.4

Telephone: FLEet Street 2236-7 Telegrams: Gasking, Fleet

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Gas Journal

VOLUME 289. No. 4879. JANUARY 16, 1957. 109th YEAR

Methane as a Fuel

THE importance of methane as a fuel, either in the almost pure state as in natural gas or as a constituent in a mixture of gas as in town gas, is well known. This was emphasised by the choice of subject for the 1956 Melchett Lecture given by Sir Alfred Egerton. Sir Alfred chose as his subject 'Methane and its Combustion' and proceeded to trace its history from the beginning of the nineteenth century to the present day.

It was as the dreaded firedamp, which was the cause of accidents in coal mines, that an interest in the combustion qualities of methane first forced itself upon the chemists of the day, and it was remarkable with what speed the original investigation was carried out by Sir Humphrey Davy, assisted by Michael Faraday, in 1815. Samples of firedamp had been collected on his way through Newcastle and a fortnight later Davy announced the principles underlying the famous and extremely successful miner's lamp, which exists today in more or less its original form with modifications of refined manufacturing techniques and greater physical strength to stand up to the very arduous life underground. Davy and Faraday also measured the limits of inflammability in methane with surprising accuracy for the apparatus available in those days. Their figures of 5½ and 14% compare very favourably with the latest figures of 5.3 and 15%.

Methane is perhaps the most useful fuel available because of many of its characteristics and because it is so widespread. Methane with its high calorific value, its great stability, and its ignition and inflammability characteristics make it a very safe fuel to use—safer in fact than almost any other hydrocarbon fuel. These latter properties have gone a long way towards making possible the safe working conditions in the coal mines of the world. Methane is not actually poisonous, as is carbon monoxide, though of course it does not support life, nor is it liable to cause smoke if burnt in a well designed burner.

To derive heat and power the world outside the U.S.S.R. and China is producing 12.42 bill. cu.ft. of natural gas and 125,000 mill. cu.ft. of manufactured gas every year, at the same time letting something like 300,000 mill. cu.ft. per annum of natural gas go to waste in the Middle East oil fields.

Twenty years ago Sir Alfred realised the frightful waste that was going on and suggested that this gas going to waste should be utilised; as a joke he said that it should be shipped to Europe. With the coming of the last war experiments were begun to investigate the possibilities of using methane as a motor fuel. In its gaseous state it was obviously clumsy to handle and the storing of it in the vehicle in some heavy, bulky type of tank, designed to contain a large quantity of gas under pressure, presented a good many difficulties. And so it dawned on the investigators that the methane must be liquefied, since the volume of the liquid is only about 1/1,000 of that of the gas for the exactly same calorific content.

The difficulties in designing a satisfactory vacuum jacketed container were overcome and the difficulties in feeding the engine were surmounted so that by 1942 a bus was running in the Stoke district, and a second in Lincolnshire in 1944. It was therefore decided to build a methane liquefaction plant to run a fleet of vehicles on liquid methane, but with the winning of the Battle of the Atlantic and the greater availability of petrol, work was discontinued. Discouraging as this may seem, it did help to establish a centre of low temperature technology at South Kensington which has continued to flourish.

The United States has taken up the idea of transporting methane in bulk and has designed a special barge to carry liquefied methane from the Gulf to Chicago in insulated tanks up the Mississippi River. The barges each contain five tanks and can carry the equivalent of 200 mill. cu.ft. of natural gas. Such an arrangement,

the many problems involved and the necessary fundamental considerations necessary to solve them, were discussed in a series of articles by Mr. John Crecca, an American, published in the 'GAS JOURNAL' in 1956. As the result of the developments in America, considerable interest has been aroused in the shipping of liquefied methane to Europe from the Middle East and from Venezuela.

The change in fuel policy to import oil to supplement our indigenous fuel supplies and refine it in England instead of importing refined petroleum products has discouraged the use of liquid methane as a motor fuel, but with the building of refineries in this country the gas industry has become increasingly interested in the distribution of tail gases from these refineries through its distribution systems, and of methane from the coal mines too, where available. To push the possible use of methane to its logical conclusion, the industry turned to the possibility of importing liquid methane to supplement its gas supplies in this country. The idea of a main carrying the surplus gas from Asia to Europe has not only been proposed but has been pronounced an engineering and financial possibility, though today even less possible politically than six months ago.

With the necessity of doing everything possible to avoid atmospheric pollution, some means must be found of transmitting the heat energy of coal to the house or the factory and utilising it there smokelessly, and avoiding oxides of sulphur being generated when the heat becomes effective. The generation of electricity by burning coal to raise steam for this purpose, or the production of gas and coke from high quality coals which are becoming scarce, is not completely satisfactory even if the combustion is perfect since here again sulphur dioxide is not eliminated. Methane synthesis, complete gasification, or hydrogenation of coal seemed to offer a solution.

Experiments have been made to convert under pressure a mixture of hydrogen and carbon monoxide to methane using the Sabatier catalysis. The many difficulties encountered in the removal of sulphur from the gases and the prevention of a deposit of carbon on the catalyst have been overcome. A gas containing 62.5% of methane was formed with a C.V. of 700 B.Th.U. per cu.ft. The Lurgi process for the complete gasification of coal was investigated and it was found that under certain conditions the production of methane was enhanced, due to the hydrogenation of the coal. By modifying the generator, undecomposed steam and carbon dioxide could be removed before they came in contact with the upper layers of the coal and the gaseous hydrocarbons thus formed gave every appearance of a gas of a C.V. of 500 B.Th.U. which would be generated at 25 atmospheric pressure.

As time goes on the production of small coal at the collieries would point to a development of fluidised techniques to produce gases from coal with considerably higher contents of methane and of much higher calorific value.

Thus methane assumes even greater importance and its production from coal by one process or another will become of greater interest. The availability of oil in this country will have a very great effect on whether these processes are ever developed sufficiently for large scale commercial production, since oil will do the things that coal will do with less trouble in handling or transportation, but unfortunately it is not an indigenous fuel and has to be imported.

Two-fuel Appliances

MUCH has been written about the importance of the gas industry being a two-fuel industry but little consideration seems to have been given to the advantages of two-fuel appliances. The great advantage of gas is its flexibility. Its disadvantage is its cost. The great disadvantage of coke is its inflexibility, but its great advantage is its cheapness. Surely the answer must be to marry the two, using coke for space heating when flexibility is not important, and gas when it is?

The paragraph above commences an article on 'Two-fuel Appliances and Flexibility' which appears in the January issue of *Gas Service and Domestic Coke*. Its author, Mr. A. C. Hazel, is of course Managing Director of Hurseal Ltd.; few meetings on domestic fuel policy and appliance design have passed without this never-say-die publicist dashing into the fray in order to extol the virtues of his 'Hurdapta.' The recent advent of a gas fire attachment which converts this free-standing fire into a gas convector fire has further encouraged Mr. Hazel to bring to the gas industry's attention the fact that a strong case can be made for a combination of a free-standing fire with gas fire attachment, used with a separate gas water heater. This, he suggests, is the answer to the common practice of installing a fire back boiler in conjunction with an electric immersion heater for summer use.

Mr. Hazel's argument is that the combination of free standing fire with restricted throat and gas water heater means a lower fuel bill for the householder, and much greater flexibility, convenience, and saving of labour. Furthermore, he says, the householder enjoys a much higher standard of warmth and comfort and there is no need to have a separate appliance for summer use only. There is a need for field tests to be conducted on a large scale, comparing the total fuel bills of a householder using a fire back boiler in winter and electric immersion heater in summer, and a householder using a free standing fire and a gas water heater all the year round.

Since all coke burning appliances should be fitted with gas for ignition, the supply of a gas fire attachment means very little extra installation cost from the householder's point of view. In addition, if coke is used in a free standing fire instead of in an ordinary inset or coke grate, quite apart from the considerably higher efficiency there are certain other advantages, such as easier ignition due to the fact that the temperature of the flue gases leaving the fire is not lowered by cold air passing over the fire, and thus the velocity of these flue gases is a little greater.

In his article the author, in his own words, 'appreciates that he has an axe to grind,' but his question 'Should we or should we not have fire back boilers installed in the vast majority of the new homes in this country?' is timely, and his submission that the suggestion he is putting forward provides the gas industry with 'a completely new market for gas' is worthy of serious consideration. We are in need of a policy which provides a real sales outlet for gas water heating. This could be it.

Integration of Two Institutes

A WORKING plan for the 'complete integration' of the two institutes devoted to the improvement of management practice in Britain is outlined in a letter circulated this month to members of the British Institute of Management and the Institute of Industrial Administration. Extraordinary general meetings of the two institutes will shortly be called with the object of bringing complete integration formally into effect on April 1, 1957. The British Institute of Management was founded in 1947 as the central national body for the study and promotion of scientific management. Its chief activities are the co-ordination of the study of management in all types of organised activity, the provision of an information service for member companies, the holding of conferences, the publication of literature on management subjects, and the development of management education in Britain. The Institute of Industrial Administration was founded in 1920 'for the purpose of providing a medium for the interchange and development of ideas and practice pertaining to the better operation of industrial enterprises in the interests of both employer and employed.' The original prospectus of the Institute also stated as an objective that 'standards of administrative knowledge may be formulated and diplomas issued as the result of written and oral examination. By these means, in conjunction with technical training and practical manufacturing experience . . . management may become established as a definite profession with its own recognised standards of attainment.'

The two institutes have been working in close association since 1949 and under a formal agreement concluded in 1951 the I.I.A. has acted as the professional wing of B.I.M. 'During that time,' states this month's letter to members, 'it has been increasingly obvious that complete integration of the two into one Institute is the proper way of doing the job for which both were founded.' It is proposed that the name of the integrated body shall be 'The British Institute of Management.' The name of the Institute of Industrial Administration will remain registered to prevent its use by any other body.

The objectives of the Institute are summarised briefly as follows: (1) To co-ordinate activities and thereby avoid duplication and overlapping with other institutes or organizations in the management field; (2) to develop branch and regional activities; (3) to collect and disseminate information of management practices; (4) to provide facilities for research; (5) to develop management education of every kind; (6) to exchange information with other cognate bodies nationally and internationally; (7) to encourage business concerns to join the institute and individuals to qualify for corporate membership; and (8) generally to advance the knowledge of good management practice and the standards of examination and experience for corporate membership.

Correspondence

HAS THE GAS FIRE A BRIGHT FUTURE?

DEAR SIR,

I am a non-technical employee in the gas industry and was most interested in your editorial of January 9. I agree 'that the use of gas for (domestic) space heating, even at today's price per therm, could have a very bright future on the grounds of efficiency and convenience.'

Tired of the performance of coke from American coal, and encouraged by a new tariff operating gas at 17.5d. per therm (after using a basic 20 therms per quarter), I had my coke grate removed three weeks ago and a modern gas fire installed in my living room. I have read my meter diligently each night, and over 21 days the gas consumed has averaged 333 cu.ft. per day—exactly 1½ therms (CV. 450). This includes cooking, and taking into account the first block of therms at 26.5d. gives a cost of about 2s. 4½d. per day, or £10 15s. per quarter. After deducting the amount of my normal gas bill, the result is certainly no more than I usually spend on solid fuel. True, I now have to heat water separately, as the back boiler is out of commission, but tests have shown this to cost only a few coppers per day. (I will not divulge the method I use!) Certainly if there is any extra cost it can only be slight, and the added comfort and convenience is more than worth it. We would not willingly give up our steady constant warmth for the former choice between fierce heat and chilly greyness.

But I am really more concerned with your statement that a fresh approach to the public is required. Without being an electrical expert a householder usually knows that a 2 kW fire uses two units per hour, and that a unit costs (in this area) approximately one penny. But leaflets from the gas showrooms tell him that the gas fire he fancies has a heat output of '16,000 B.Th.U. per hour.' He might just as well be told the tensile strength of the outer casing. Some makers do state something like 'hourly consumption 32 cu.ft. (C.V. 500),' which is little better. The leaflets are intended for the public, so why cannot they state that the fire, when turned on fully, will burn for 6¼ hours for one therm. The prospective purchaser could then work things out for himself at home, without borrowing a 'GAS SERVICE' Pocket Book. The only exception that I know is the leaflet on the GasMiser, issued by Cannon; this is excellent and includes a really touching exhortation to the housewife. Unfortunately the price of the appliance is so high that few persons will ever reach the stage of reading the leaflet.

In my opinion the gas consumption should be controlled at the appliance and not by using the supply tap. When selecting my fire I was appalled to see fires which had no tap on the appliance; presumably they are intended to burn flat out all day, on the 'all or nothing' principle. I can think of nothing more likely to cause a thoroughly dissatisfied customer than to sell him an appliance which will cause him to receive a quarterly gas bill in the region of £20. Because I did not welcome having no positive control over the consumption I decided against what was otherwise a very suitable and handsome model, and spent another £6 on an appliance with a 3-position tap. The leaflet stated that the tap incorporated 'two turn-down positions indicated by click stops, which allow the heat output to be adjusted as required.' But there was no indication of the approximate reduction in output effected by the click stops, nor could the information be found by the sales staff. Eventually I found in a review in your 'JOURNAL' (or it may have been in a rival publication!) that the positions gave four-fifths and three-fifths of the full rate. I might add that although there was a fair choice of fires without control taps, the one I chose from a leaflet (dated 1955) had never been stocked and had to be obtained specially. Oh, I know it may not have been approved by Watson House but then neither should have the tapless ones have been. And it is made by probably the best-known manufacturer of gas appliances in the country. Can you imagine a 3 kW electric fire being sold without any provision for reducing consumption to 2 kW and 1 kW?

I would install a gas fire in my sitting room, where there is no gas supply, if the cost of installation were not so great. Is there not a moral here? Would it be such bad business to subsidise installation costs when there is a possibility of gaining an increase in consumption of about 200 therms per therm?

In conclusion I repeat that I am not a technical man, so if I have mixed up consumptions with outputs or anything similar I apologise. And, of course, the opinions I have expressed are purely personal.

Yours faithfully,

'PROSELYTE.'

Hull,
January 10, 1957.

Personal Notes

MR. JOHN WARREN, O.B.E., General Secretary of the National and Local Government Officers' Association has announced his intention of retiring after the Association's annual conference in June. He is 61. When he became its chief officer in 1946, NALGO was a trade union for local government officers only and had a membership of 134,000. Soon after his appointment it expanded to cover the officials of five other public services—gas, electricity, hospitals, road passenger transport, and new towns—and its membership has since increased to 240,000. It is today the biggest trade union of 'blackcoated' workers in Britain, with an annual income of nearly £500,000 and assets exceeding £14 mill. Before his appointment to its staff, Mr. Warren held many honorary offices in NALGO and was a member of its National Executive Council from 1935 to 1945. He played a leading part in the establishment of 'Whitleyism' in the local government service and is secretary of the staff side of the National Joint Council for local government officers.

MR. HARRY A. CATTON has retired from Radiation Group Sales, Ltd., after serving for 40 years in the gas industry. He started as a furnace representative with Richmonds in October, 1916, and on the formation of Radiation became Sales Manager for the Radiation furnace department. In 1921 he became the Midland Representative for Richmonds, and in 1926 was appointed Midland and Southern Representative. Mr. Catton was appointed Southern Sales Manager in 1933 and on the formation of Radiation Group Sales, Ltd., in 1950, became Midland Regional Sales Controller.

MR. EDGAR RACE, of Parsonage Close, Mosbro', Derbyshire, who has retired at the age of 65 from his position as Local Superintendent of the Eckington, Mosbro', Killamarsh, Renishaw and Ridgeway gasworks, has spent 52 years in the gas industry. He retired on December 31 after 16 years as Local Superintendent. His previous posts included that of Manager and Secretary of the former Killamarsh Gas Company.

MR. MORLEY A. GRIFFITH-JONES, O.B.E., has been appointed to the Board of W. H. Dean & Son, Ltd., manufacturers of gas-heated home laundry appliances. Mr. Griffith-Jones joined the Company as Sales Manager 12 months ago. Prior to that he was on the staff of the North Thames Gas Board.

MR. HUGH MICHAEL SELLS has been appointed Field Manager of the Scottish district for British Oxygen Gases, Ltd. The appointment took effect from January 1, and Mr. Sells will be based at Glasgow.

MR. E. W. WORRELL has been appointed lecturer in ceramics in the Department of Gas Engineering, Leeds University.

MR. S. J. BRADLEY has been appointed Sales Representative for the East and West Midlands Gas Board areas for R. Russell & Sons. Mr. Bradley joined the Company on leaving his position as Group Sales and Service Superintendent, Smethwick Group, West Midlands Gas Board. He has spent the whole of his career at Smethwick and is well known through his association with the West Midlands Gas Board sports association.

MR. E. H. HEARNDEN, Local Manager for the East Midlands Gas Board at Wellingborough, Northants, since the industry was nationalised, and previously Works Manager of the Wellingborough undertaking, has retired after nearly 45 years in the gas industry.

MR. D. A. BISHOP has been appointed Export Manager of F. E. Wetherill, Ltd., of Welwyn Garden City, manufacturers of loading shovels.

MR. E. H. D. SKINNER, C.B.E., will vacate the office of Chairman of the Durham Division of the National Coal Board on February 28.

Obituary

MR. JOHN PIERRE FEYEREISEN, JR., died recently at the Mt. Sinai Hospital, New York City, after a lingering illness. Mr. Feyereisen was born in Waterloo, Iowa, in 1915. After graduating from the Vogue Art School, Chicago, Illinois,

Mr. J. P. Feyereisen

and the Bryant School of Business in Providence, Rhode Island, he became associated with the Sprague Meter Company, Bridgeport, Conn., and has been with the firm for 20 years in the capacity of Advertising Manager and Assistant to the President.

MR. GEORGE H. ROBINSON, who had been a Director of United Gas Industries and its subsidiary companies since 1936, died at his home on January 3 after a long illness. Mr. Robinson joined J. H. Robinson & Co. (Liverpool), Ltd., in 1919, and became Secretary of that Company in 1921. In 1928 he was elected to the Board and in 1929 the Company became part of the United Gas Industries Group. In 1936 Mr. Robinson was elected to the Board of the parent Company.

Diary

January 17.—EASTERN JUNIORS STAMFORD: 'Industrial Space Heating,' C. A. Lewis.

January 17.—MIDLAND JUNIORS: Visit to works of the Incandescent Heat Co. Ltd. Smethwick. 2.30 p.m.

January 18. — INCORPORATED PLANT ENGINEERS, BIRMINGHAM BRANCH: Imperial Hotel, Temple Street. 7.30 p.m. 'Arc Welding,' lecture and film.

January 19.—LONDON AND SOUTHERN JUNIORS: Visit to South Eastern Gas Board Acid Works, Phœnix Wharf.

January 21. — EASTERN G.C.C.: Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2. 2 p.m.

January 21.—NORTH EASTERN G.C.C.: Gas Board Head Office, Bridge Street, Leeds, 2.45 p.m.

January 21.—WEST MIDLANDS G.C.C.: Gas Offices, Birmingham 3, 2.30 p.m.

January 22. — SCOTTISH WESTERN JUNIORS: Evening Visit to the India Tyre & Rubber Co. Ltd., Inchinnan, assemble at factory 6.30 p.m.

January 23. — INSTITUTE OF FUEL: Institution of Civil Engineers, Great George Street, London, S.W.1. 5.30 p.m. 'The Chemistry of Coal and its Relation to Carbonisation,' I. G. C. Dryden.

January 23. — WESTERN JUNIORS: Bridgewater. Visit to works of Wilmot-Breeden.

Calendar & Directory Alterations

The following changes have been notified during the past month. To keep the information in the current issue of the 'GAS JOURNAL' Calendar and Directory up to date readers are invited to note these alterations in the Directory Section.

Page D24. SHEFFIELD NO. 1 DISTRICT: W. E. Whiten, *District M.*, vice J. E. Brandon.

Page D67.—SOUTH EASTERN GAS BOARD: C. J. B. Sawbridge, *Chief Accountant*, vice C. Stredwick, deceased.

Page D72.—SUSSEX DIVISION: A. Bell, *Sales and Service M.*, vice A. Tennant.

MR. ALEC F. HOPKINSON, who has recently held the position of Technical Engineer attached to the London office of Hopkinsons, Ltd., has died. Mr. Hopkinson, who was well known among engineers in the London area, also made a number of business visits abroad on behalf of the firm.

CAPTAIN BARRY FRANCIS MCCORKELL, who died on January 2, had been Chairman of Londonderry Gaslight Company for many years.

PEERAGE FOR MINISTER OF POWER

New Ministry Carries Cabinet Rank

AN INDUSTRIALIST—NOT A POLITICIAN—HAS BEEN APPOINTED MINISTER OF POWER IN MR. MACMILLAN'S NEW GOVERNMENT. HE IS SIR PERCY MILLS, 67, AND HIS NEWLY-CREATED MINISTRY—WHICH SUCCEEDS THE MINISTRY OF FUEL AND POWER—ASSUMES RESPONSIBILITY FOR STEEL AND DEVELOPMENT OF THE USE OF ATOMIC ENERGY FOR INDUSTRIAL PURPOSES, AS WELL AS THE EXISTING FUNCTIONS OF THE OLD MINISTRY IN RESPECT OF COAL, GAS, ELECTRICITY AND OIL.

Sir Percy Mills receives a peerage and will be included in the Cabinet.

The new Minister is Chairman of W. & T. Avery Ltd., the Birmingham manufacturers of weighing and counting machines, and a director of several other companies.

He was the head of the production division in the Ministry of Production, 1943-44, and President of the Economic Sub-commission of the British group in the Control Commission for Germany between 1944 and 1946. During 1951-52 he was called in by Mr. Macmillan, who was then Minister of Housing and Local Government, to advise him on ways of increasing the rate of house building. He is Chairman of the National Research Corporation.

Press comment on the new appointment is naturally guarded. 'The idea of bringing in a man of great industrial experience to run a Ministry has been tried several times before, usually in wartime,' said the *Financial Times* on Monday. 'The record seems to suggest that these appointments either succeed very well, or fail completely, according to the adaptabiity of the individual to political conditions.

'Certainly, however, Sir Percy Mills has very wide experience, and his services to the Ministry of Housing as expert adviser have already brought him into close partnership with Mr. Macmillan in the past.'

The Times is wholeheartedly in favour. 'The nature of the new post and the man to fill it show that the Prime Minister has grasped one of the main keys to Britain's economic future,' said its leading article.

But while the *Manchester Guardian* points out that Sir Percy 'does not belong to "the old school tie" tradition,' the *Financial Times* is concerned that the 60 or more mining Members sitting on the Labour benches of the House of Commons are 'likely to resent the Minister of Power sitting in the House of Lords. There may also be miners' suspicions of Sir Percy Mills' past as a vigorous negotiator of engineering wages.'

North Western Gas Board to Market New Smokeless Fuel

THE North Western Gas Board announce that authority has been received from the Minister of Fuel and Power to market a new solid smokeless fuel, perfected for household use by the Board's technologists, at a price of £9 7s. 9d. per delivered ton, or 9s. 6d. per delivered cwt. bag.

Under the name 'Phimax,' the new fuel will be offered for sale in the Greater Manchester area as from Monday next (January 21). As it has been developed to replace bituminous coal in open fireplaces it will be sold, as far as possible, exclusively through coal and coke merchants.

At the price at which it is to be offered it will be dearer than coal, but the Board claim that shilling for shilling it will give householders better heating value than the best coal. It is, in fact, a refined coal, the Board claim, with all coal's advantages and none of its disadvantages.

The new fuel is the result of several years' experiment by the Board's technologists, who set themselves the task of using conventional vertical retorts, designed for high temperature carbonisation of coal, to produce by low temperature carbonisation a fuel which would retain part of the volatile elements of the coal but would be entirely free of smoke-producing elements.

Hitherto it has been impossible to do this at economic speeds in high temperature retorts.

The problem was solved by applying a process developed some three years ago by the Board for accelerating carbonisation speeds in vertical gas making retorts. Known as the 'Rochdale' process, this consists of injecting a carrier gas under pressure into the base of the retorts during carbonisation, so that the gas carries the heat from the lower part of the coal charge up through the centre.

Using this process at low temperatures the Board's experts produced an entirely new type of smokeless fuel more reactive than any other hitherto produced. The new fuel burnt with a cheerful flame and was suitable for use in any kind of open fireplace. In fact, it burnt best without any under-draught at all.

At present it is being produced only at the Board's Partington works where the 'Rochdale' process has been in commercial operation for some time. Production is at the rate of 130 tons a day, and no more than this daily quantity can be produced this winter. By next winter, when a number of other works in the Board's area have been converted to use the 'Rochdale' process, it is hoped to double or treble production and to offer the new fuel for sale in other parts of the North West.

EDINBURGH SAFETY CAMPAIGN

In the last six months officials of the Edinburgh Division of the Scottish Gas Board have inspected 1,160 houses where old people live alone, examining fittings to see that they are safe.

1957 Coke Exports Get Off to Good Start Aboard Maiden-voyage Vessel

THE North Western Gas Board's first cargo of coke for the Continent in the New Year sailed from Garston Dock, Liverpool, on January 2, in a motor vessel, the 'Irish Willow,' making her maiden voyage. Her destination was Amsterdam, where the 1,500 tons were to be transhipped to Germany.

In 1956 the North Western Gas Board exported 143,503 tons of coke worth nearly £1 mill. Customers included Denmark, Norway, Finland, Eire, Germany, Holland and Belgium. Small quantities went as far as Bolivia, Iran and the Leeward Islands. The biggest customers were Denmark (59,000 tons) and Norway (62,000 tons).

About 80,000 tons of coke for various destinations abroad will be moved from the Board's area between now and the end of March. Five thousand tons of this will be for Austria, probably the first consignment of coke ever to be sent from the U.K. to that country. The order is due to the situation in Hungary and the loss of production in the coal mines there.

Celebration Party

The owners of the 'Irish Willow,' Irish Shipping, Ltd., gave a celebration party aboard the vessel before she sailed. It was attended by Mr. W. Stephenson, the North Western Gas Board's Coke Officer, Mr. J. G. O. Drake, the General Manager of the Board's Liverpool Group, and other Board officials.

Mr. C. Kinsella and Mr. D. O'Neill, representing Captain J. O'Neill, Joint Manager of Irish Shipping, Ltd., were the hosts. Mr. T. G. Fishwick and Mr. H. O. Jones, agents for A. Coker & Co., Ltd., of Liverpool, and Mr. H. Evans of the Modern Transport Company of Liverpool were among the guests.

MORE CONTROL OVER EFFLUENTS URGED

A SUGGESTION that local authorities should be given greater control over the discharge of trade effluents into the public sewers has been put to the Government by the Association of Municipal Corporations, which represents borough councils throughout the country.

The association is urging in a memorandum that the 'prescriptive rights' possessed by many concerns should be abolished and that the whole of the effluent discharged into sewers should be fully controlled by the local authority.

'Difficult to Comply'

It points out that continuance of the existing exemptions will make it difficult, if not impossible, for many local authorities to comply with the standards of purity of sewage effluents likely to be required by river boards under legislation dealing with the prevention of pollution.

A Special Meeting of Grangemouth Town Council is to be held to discuss a report being prepared by officials regarding the supply of gas cookers to municipal houses. Up to the end of the second world war the Gas Department supplied and maintained cookers to tenants of Council houses free of charge. Since then the Housing Department has been supplying cookers to new houses and maintaining existing ones.

News in Brief

BRADFORD Corporation Health Committee has given instructions for a scheme to be prepared under which certain parts of Bradford would be considered for designation as smoke-controlled areas.

The Leeds University new buildings appeal for £600,000 has already reached £280,000 in just less than a month and includes £250 from the North Eastern Gas Board for the Department of Gas Engineering and General Fuel Science.

Edinburgh Division of the Scottish Gas Board held a party recently for 900 children of the employees. The cost—about £170— was borne by the Division's social club entertainment fund.

Pictured at the 1957 annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association (BIMCAM) in London on January 8, are, left to right: Mr. F. J. Erroll, M.P., Parliamentary Secretary to the Board of Trade; Mr. L. S. Yoxall, President of BIMCAM; Mr. R. G. Kent, Sales Director of George Kent, Ltd., and Chairman of BIMCAM; and Dr. W. A. Macfarlane, Chief Executive, National Industrial Fuel Efficiency Service.

Yorkshire Juniors Attendance Drop

PETROL rationing and the holding of football cup ties were responsible for a falling off in attendance at the January meeting of the Yorkshire Juniors held at the Strafford Arms Hotel, Wakefield, when Mr. P. C. Egan, Chemical Engineer of the North Eastern Gas Board at Leeds, gave his keenly anticipated paper on 'Dry Purification of Gas by the Gastechnik System.'

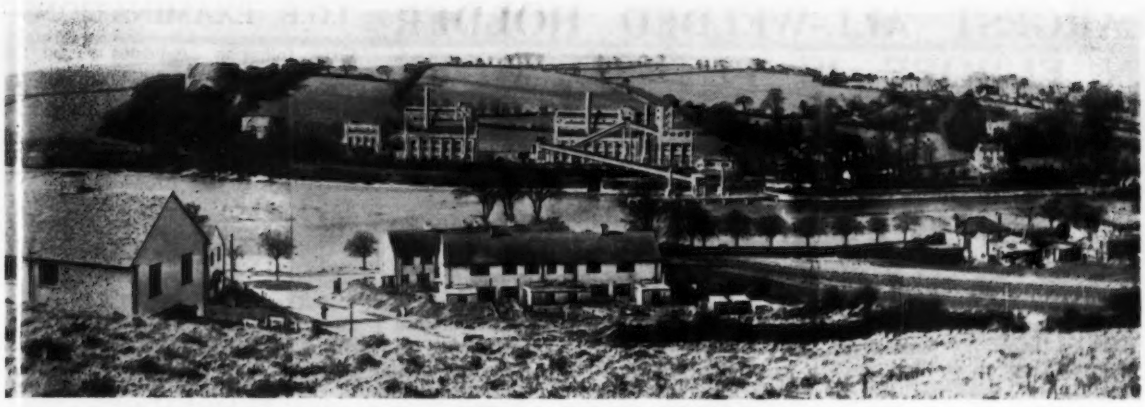
The paper described the plant at work at the North Eastern Gas Board station at Royston, so far the only plant at work in this country, and still regarded by the Board as experimental.

Mr. R. H. Anderson presided over the meeting, which was also attended by Mr. J. M. McLusky, Group General Manager at Wakefield, who supported the President and the speaker, and also by representatives of Robert Dempster & Sons, Ltd., engineers, of Elland, the licencees responsible for the development of the system in this country.

After a discussion, Mr. B. C. Smith, of Dewsbury, moved a vote of thanks to Mr. Egan.

Tower Purifiers at Dover

In our reference, on p. 788 of our Annual Review Number of December 29, 1956, to the extensions being carried out at the Dover Works of the South Eastern Gas Board, we attributed the installation of the tower purifier plant to W. C. Holmes & Co., Ltd. This, of course, should have read Newton Chambers & Co., Ltd., who completed this installation about two years ago. Our apologies to those concerned.



A composite photograph of the Newham works.

New Bulk-supply Works Go Into Production

EXPENDITURE JUSTIFIED, SAY BOARD

THE new gasworks of the South Western Gas Board which have been under construction for the past three years at Newham, Truro, were to go into production yesterday.

These works comprise an installation of intermittent vertical retorts capable of carbonising 130 tons of coal a day—producing 2 mill. cu.ft. of gas and 75 tons of smokeless fuel-coke and breeze. The layout of the site provides for doubling this output at a later date. The present capacity is nearly four times as great as that of the old works at Lemon Quay, only a part of which will be retained as a gasholder station and local distribution centre.

IMPROVEMENT

The release of the site of the old retort house, and the river frontage and 'Gas Creek' will make possible a desirable improvement of this area, and preliminary negotiations are in hand for disposal to the City Council.

The new works will also enable the old works at Falmouth and St. Austell to be closed, and in conjunction with the reconstructed works at Penzance will produce the gas required for Truro, Penzance, Falmouth, Penryn, St. Austell, St. Blazey, Fowey, Lostwithiel, Redruth, Camborne, Hayle, and St. Ives. These towns have all been linked by the laying of 70 miles of bulk supply mains which will also bring for the first time, a gas supply to a large number of villages and hamlets en route.

The closing of the Falmouth works, which is situated in the centre of the town, will make a useful contribution to the easing of traffic congestion in the narrow Church Street and its harbour frontage will become available for development.

When the first sod was cut by Sir John Carew Pole, Chairman of the Cornwall County Council, January 19, 1954, the site of the Newham works was a hilly and somewhat derelict field. It has since been laid out as three level terraces with massive retaining walls of Cornish granite.

Reinforced concrete would normally have been used for this form of construction of retaining walls, but the Board found that granite was no more expensive, and even had certain advantages.

COLLABORATION

The design and layout of all the works have been carried out in close collaboration with the County Planning Committee, and its officers, and the City Engineer and Harbour Master.

The Board originally prepared plans in 1951 for the reconstruction and enlargement of its old works at Lemon Quay, but after discussions with the County and City authorities it was agreed that such development would detract from the City's amenities.

At that time the Board's Southern Divisional Manager—and since 1954 its Chief Engineer—was Mr. Leslie P. Ingram, M.B.E. He is the son of the late Mr. S. J. Ingram, who for over 30 years was the Engineer and Managing Director of the former Truro Gas Company.

Being a native of Truro, he naturally had its interests very much at heart, as well as those of the Board, and the selection of the new site and its development was in no small measure due to him and his local knowledge.

The approximate cost of the works at Newham has been £750,000, of the Penzance works reconstruction £140,000, and of the associated bulk supply mains £520,000—a total of £1,410,000.

The expenditure is amply justified, say the Board, by the great economies effected in the use of coal and manpower, enabling the Board to offer the same low running rate for gas in Cornwall as in the rest of their area. This could not have been achieved by the old, small works taken over by the Board.

A further group of towns—St. Columb, Padstow, Wadebridge and Bodmin—and intervening villages—are now supplied from the enlarged Newquay gasworks. Work is in progress on a link main from Lostwithiel to Liskeard, and a further link is planned between Bodmin and Lostwithiel. These will join the West Cornwall gas grid to the Plymouth grid which already supplies Tavistock, Saltash, Gunnislake, Callington, Liskeard, Looe, and Launceston. These links will not only safeguard gas supplies throughout the Duchy, but enable plant at the new works to be operated at very high efficiency.

Of the 27 gasworks in Cornwall taken over by the Board, only three at Truro, Penzance and Newquay now remain as major stations, and 20 have been closed. Bude works, owing to its isolation, still remains in production and the closing of Helston works must be deferred during the 'capital squeeze' until the link main to the grid can be completed.

UNDERWATER

St. Just is supplied with gas made from oil refinery butane, and Torpoint will probably be supplied from Plymouth in the near future by an underwater pipeline across the Hamoaze.

Gasworks Close After Century

ECONOMY MEASURE

After having been in operation for over 100 years, the gasworks at Bourne, Lincs., will be closed when the East Midlands Gas Board's scheme for providing Bourne with a bulk supply of gas from Spalding, about 12 miles away, is carried out. The project will cost about £40,000 and work will start on April 1.

The saving on coal alone is estimated at £3,000 a year and the output of gas from the Spalding works of 300 mill. cu.ft. a year will be increased to 342 mill. cu.ft. a year. Gas from the Spalding works is already going to Holbeach, Sutton Bridge and Long Sutton.

LARGEST ALL-WELDED HOLDER IN EUROPE IS PUT TO WORK

THE new 6 mill. cu.ft. all-welded gasholder at Stapleton Road works, Eastville, Bristol, was commissioned and put to work last week. After testing the holder was purged with inert gas which in turn was purged with coal gas.

The holder was planned by the Bristol Gas Company and tenders were invited, but it was not until after nationalisation that the orders were placed for a reinforced concrete water tank and the gasholder. Work was begun in 1951, difficulties—principally caused by the shortage of steel—hampering progress.

The site—in Glenfrome Road—was once an old quarry, which had been filled in with ashes over a period of many years. The whole of this was excavated down to rock level and at one part of the site blasting of the rock had to be carried out.

The tank is approximately 42 ft. deep and has a capacity of 7 mill. gal. of water. The construction is of reinforced concrete and the whole of the work was carried out by A. Monk & Co., Ltd., of Warrington and London. The inside of the tank was given a bitumen lining to ensure that it was completely watertight.

The gasholder is the largest all-welded gasholder in Europe and was constructed by Oxley Engineering Co., Ltd., of Leeds. It is constructed on the telescopic principle in four 'lifts,' so that the depth of the tank is much less than would otherwise be necessary.

The output of gas in Bristol on a winter's day is about 30 mill. cu.ft. The value of the new gasholder to Bristol is that it ensures adequate stocks of gas in the coldest weather.

When the holder is painted—possibly in the spring and summer—the holder will be painted four shades of grey, the darkest at the bottom. This colour scheme has been chosen as being the most appropriate to the surroundings.

I.G.U. Committee Discuss Gas Vocabulary

A SPECIAL committee of the International Gas Union has been held in London to 'consider the manner in which could be published the seven-language gas vocabulary.'

The vocabulary is to appear as a single volume of three parts, the main section comprised of internationally classified words, and the other two containing sketches and alphabetical indexes (one for each language).

Tables will list abbreviations used in different countries and give unit conversions. Definitions, however, will be provided only when necessary.

An initial list of some two thousand concepts is almost complete.

Dr. W. T. K. Braunholtz, O.B.E., represents Britain on the I.G.U. 'Vocabulary Committee.'

COUNCIL AGREE TO N.E.G.B.'S REQUEST

The North Eastern Gas Board has asked Aireborough Council to help in avoiding 'unfair competition' between the two State-owned undertakings of gas and electricity. The Board says it has noticed that Aireborough Council has agreed to allow prospective council house tenants to have a quick heating hot plate fitted to their electric cookers provided they bear the costs.

The Board requested the council to offer similar facilities to tenants who wished to have variations made to standard gas cookers in order to ensure that no undue preference be given to the electricity Board. The gas Board says that for the same price as the electric cooker it will supply a gas cooker which will enhance any property.

The Council agreed to the request.

THEY SEE LIFE!

WILSON & Mathieson Ltd., gas cooker and appliance makers of Armley, near Leeds, take a special interest in their employees. They believe that visits to a variety of places they would not otherwise see is valuable to employees both socially and educationally.

An extensive and comprehensive programme of visits has been arranged for the winter and already employees have toured various works and visited such places as Leeds C.I.D. Information Room (where the working of the mobile police was explained), Leeds Civic Hall, Leeds City fire brigade headquarters where they were shown the 100 ft. turntable ladder, the English Electric Co., Ltd., Bradford, and to the C.I.D. offices of the West Riding Constabulary at Wakefield.

Silver Jubilee Convention

The Coal Utilisation Council is to celebrate 25 years' work with a Silver Jubilee Convention in London on October 21. Further arrangements will be announced when completed.

Intending delegates are being advised to book hotel accommodation early as the convention coincides with the Motor Show.

I.G.E. EXAMINATIONS

THE following candidates passed the main subject examination under the old Regulations (Communication 275) of the Institution of Gas Engineers and have now qualified for the award of certificates by completing outstanding ancillary subjects.

HIGHER GRADE EXAMINATIONS

Internal Candidate

Gas Engineering (Manufacture)

Class	*Name*	*College*
Second	Gray, J. F.	Newcastle

Gas Engineering (Supply)

Class	*Name*	*College*
Second	Rowley, S. J.	Newcastle

External Candidates

Gas Engineering (Supply)

Class	*Name*	*Town*
Second	Andrews, W.	Liverpool
Second	Vaux, H.	Port Talbot

ORDINARY GRADE EXAMINATIONS

External Candidate

Gas Engineering (Supply)

Class	*Name*	*Town*
Second	Riley, A.	Leeds

ASSOCIATE MEMBERSHIP EXAMINATION

Gas Engineering (Manufacture)

Name	*Town*
Amphlett, D. T.	Wall Heath
Barber, D.	Thurnscoe
Birch, J. F.	Swindon
Blackett, W. D.	Darlington
Boulton, D. W.	Swindon
Brothwell, F. C.	Darlington
Chadwick, K.	Preston
Collins, E. E.	Malvern
Dent, C. L.	Hartlepool
Gracie, P.	Motherwell
Hearfield, L.	West Hartlepool
Heitzman, P. F.	Walsall
Lount, G. F.	Hinckley
Mills, J.	Glasgow
Potts, E.	Manchester
Reeve, A. J.	Earl Shilton
Richardson, F. P.	Preston
Ruddick, A.	Sunderland
Skilbeck, R.	Mirfield
Spencer, G. B.	Wigan
Woodhead, F. C.	Burnley

Gas Engineering (Supply)

Name	*Town*
Ainsworth, F.	Preston
Barnes, M. G.	Harrogate
Evans, R.	Liverpool
Farragher, T. L.	Workington
Greiff, P.	Bradford
Harrison, P. J.	Liverpool
Howard, F. S.	Greasby
Mackechnie, J. D.	Potters Bar
Peacock, J. E.	Newcastle-upon-Tyne
Scott, G. B.	Glasgow
Waring, J. I.	Burnley

DIPLOMA GRADE EXAMINATION

Gas Engineering (Manufacture)

Name	*Town*
Mamers, B.	Chesterfield

CERTIFICATE IN GAS SALESMANSHIP AND CONSUMER SERVICE

Class	*Name*	*Town*
First	Barber, J. L.	Maidstone
,,	Blake, B. P.	West Drayton
,,	Cardwell, J. W.	Sunderland
,,	Cramp, S. J.	Greenford
,,	Gunner, J. F.	London
,,	Haddock, K. J.	Swansea
,,	Stone, A. W.	Margate
Second	Balmer, T. N.	Newcastle-on-Tyne
,,	Cherry, A.	Newcastle-on-Tyne
,,	Clewer, N. F.	Hornchurch
,,	Dale, G. E.	East Molesey
,,	Dawes, M. F.	Newport
,,	Gillingham, A. J.	Christchurch
,,	Fortnam, L. S.	Morden
,,	Gray, J. J.	Newcastle-on-Tyne
,,	Harvey, E. W.	London
,,	Head, D. C.	Ramsgate
,,	Johnson, G. E.	Hounslow
,,	Kennard, J. J.	London
,,	Laycock, J. A.	Bolton
,,	Lloyd, R. C.	Caerphilly
,,	Lower, H. J.	London
,,	Moore, A.	Leeds
,,	Morris, W. V.	Bolton
,,	Press, J. A.	Bournemouth
,,	Pyke, N. N. A.	Maidstone
,,	Stone, L. T.	Margate
,,	Thorogood, H. R.	London
,,	Todd, L.	Newcastle-on-Tyne
,,	Welch, C. R.	Morden

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✓● BOLTON II
✓● BRADFORD II
✓● BRISTOL
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✓■ EDINBURGH V
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● NEWQUAY I & II
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● READING
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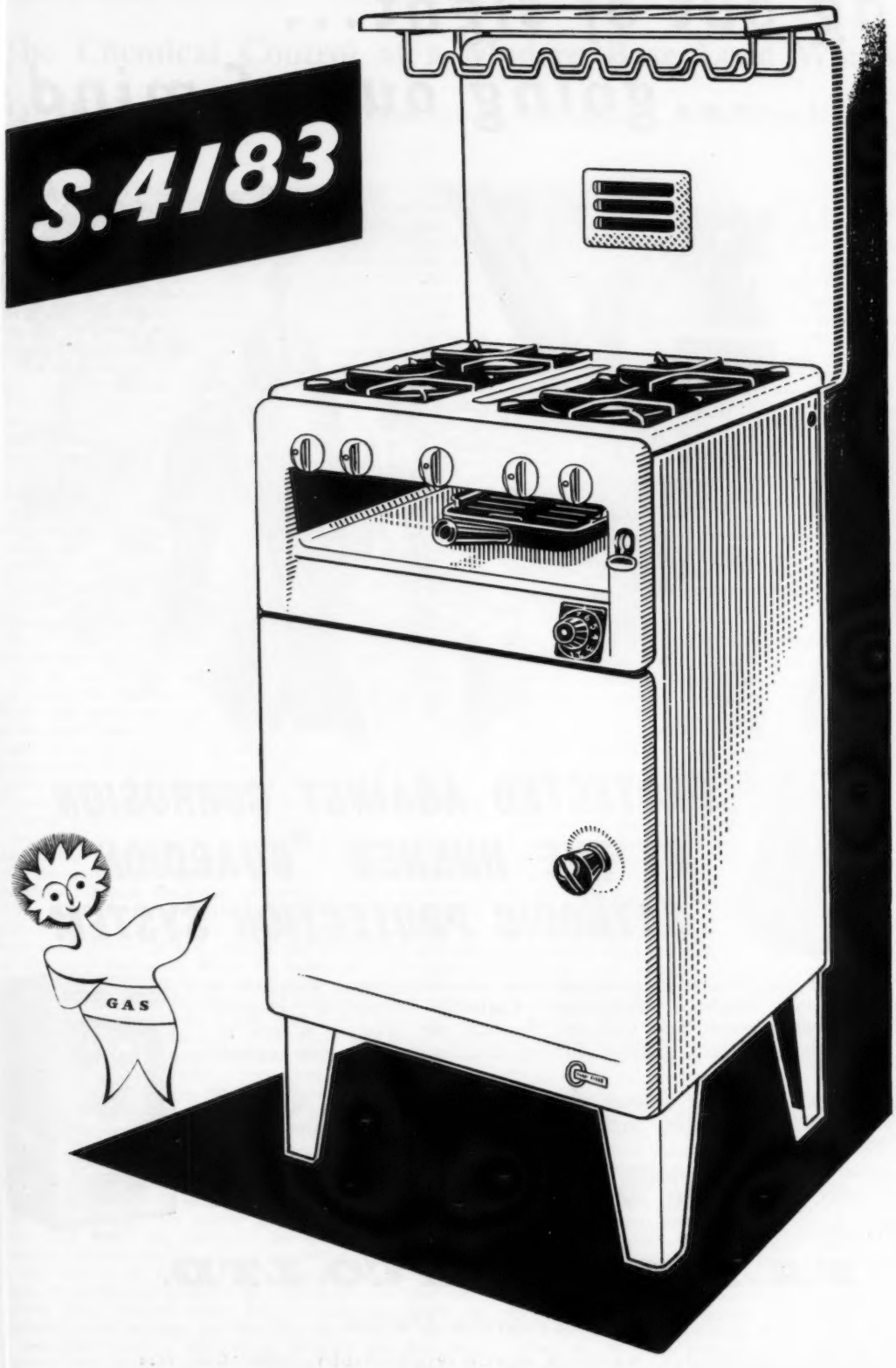

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From a paper to the Western Junior Gas Association, Bideford, November 10, 1956

The Chemical Control of a Modern Base Load Works

By D. R. JONES, A.M.Inst.Gas E., A.M.Inst.F., A.M.I.Plant E.

WITH the modern tendency to establish large base-load stations integrated into a distribution grid system comes the necessity for specialisation. The functional head of the works is now the station engineer and to him all departmental heads are naturally responsible. The utmost co-operation between departments is desirable while at the same time specialists are required to obtain the highest standard of works technical control. It is with the organisation of the chemical control of Stapleton Road works that this paper is concerned.

The Stapleton Road works of the South Western Gas Board has been extended and modernised by the installation of a new 20 mill. cu.ft. per day West's continuous vertical retort house, with all ancillary plant. The heat balance of the works has been very carefully calculated to obtain the maximum effective thermal recovery by providing for the generation of electricity by steam from waste heat boilers, and a Babcock & Wilcox chain grate water tube boiler operating on fine breeze at a pressure of 250 lb per sq. in. Shortage of sufficient local natural water supplies necessitated the provision of an internal cooling tower water circuit from the power house and primary condensers. A revolutionary feature of the new works is a 12 mill. cu.ft. per day base load liquid purification plant, installed by W. C. Holmes & Co., Ltd., to operate on the Manchester process. The maximum output of the station is now 16 mill. cu.ft. per day from base load plant, with room for extension to 30 mill. cu.ft. per day if required.

At the time of the reconstruction, regulations in force did not allow the building of a large new centralised laboratory block, and therefore, small control laboratories were included at the retort house, liquid purification plant, and water softener plant, as an integral part of the new buildings. Apart from certain minor problems in supervision, necessary duplication of apparatus, etc., these laboratories have proved to be of great advantage, particularly in reducing walking time, a matter of no small moment in a works of 40 acres area.

In general the works senior chemist is directly responsible to the Station Engineer for all chemical control on the works, and chemical liaison between the works in the division is maintained through the divisional laboratory under the control of the Divisional Chemist. The divisional laboratory also deals with problems in connection with consumer service, with the centralised analysis of coal received and with advice and help on all special problems. Within the works itself, the chemical department controls by-product plants, water treatment, calorimetry, the chemical control of purification, fuel testing, the evaluation of by-products sold, and renders analytical and advisory services in those parts of the works such as the retort houses, where a senior technical assistant has executive responsibility for technical control. Very close co-operation exists between all departments, which is obviously to the mutual advantage of all parties, and in the best interests of the general works efficiency.

Co-ordination of Duties

A factor that is carefully assessed is whether a specific test should be based on a routine schedule or done 'as and when required.' The former course allows the co-ordination of duties and makes the maximum use of the time available, although the total number of tests possible is naturally limited by the size of the staff. It is important when abnormal behaviour is being investigated on a particular plant that comparable data obtained under normal conditions should be available for comparison, and this data can never be obtained in retrospect unless a schedule of essential tests has been operated from the time of commissioning. The time saved by these figures may more than recompense the trouble taken in keeping reliable records.

As can be appreciated, the distribution of staff between a number of small laboratories, renders direct supervision necessarily infrequent, and the success of the scheme depends on the full and conscientious co-operation of all staff. A chemist or a junior chemist is normally in charge of each control laboratory and a trainee is attached to him. At convenient intervals a change is made to give each trainee a broader basis of experience. All staff are familiar with certain priority tests in all sections, and obtain experience of these in operating the Sunday rota of duty when they may encounter a variety of problems in differing parts of the works.

One of the results of the works extensions was to double the number of certain normal gasworks control tests by the introduction of a second parallel gas stream. In addition to this, some of the new plants and processes require considerably more chemical control than their predecessors in order to attain the efficiencies for which they were designed and it should never be forgotten that although the designer may build into a plant the means of obtaining economies and improvements, it remains with the works technical staff to see that these advantages are not lost for lack of the accurate control. Some of the more particular aspects of the department's duties will now be described, which will illustrate how the chemical control of such a works as Stapleton Road can be conveniently sectionalised.

Water Treatment

Water for the works, which is drawn from the River Frome, contains various quantities of suspended matter, and has a very fluctuating chemical composition depending on the rainfall. The water is first chlorinated by a Wallace & Tiernan chlorinator supplied by a battery of 70-lb. cylinders. The chlorine demand of the water shows considerable variation and control is by the colorimetric determination of residual chlorine by o-tolidine or potassium iodide. A normal demand is 0.3 p.p.m. at the softener which gives a good control of algae formation in the works coolers, etc., supplemented by 'shot' treatment of the cooling tower pond with sodium hypochlorite solution. The chlorinated river water is filtered and passed to a lime softener where the lime dosage is controlled according to the daily tests of the temporary hardness to be removed. The most satisfactory results have been obtained by the use of E.D.T.A. (disodium dihydrogen ethylenediamine tetracetate), particularly where the calcium and magnesium hardnesses are required. The water is filtered, stabilised, and the residual mainly permanent hardness removed in an exchange vessel containing carbonaceous zeolite.

The operators test the water leaving this vessel hourly with standard soap solution to ensure zero hardness, and when the bed is spent, as indicated by the presence of a small trace (say 10 p.p.m.) of hardness, it is regenerated with salt and (diluted) 98% sulphuric acid to directions laid down by the water treatment chemist. The *p*H of the final water, as measured by electric *p*H meter, is controlled by the continuous addition of small amounts of caustic soda, and a small phosphate reserve is also maintained in the boilers by the addition of sodium hexametaphosphate at the same point. Dissolved oxygen tests are also necessary to check the efficiency of the mechanical deaerator. In the eight waste heat boilers, in the Babcock & Wilcox water tube and in the three Lancashire boilers, tests for T.D.S. are made three times per week to control blowdown, and a more complete analysis is made weekly to determine the phosphate dosage. When boilers are taken off for inspection, they are examined by a chemist and a report is made on their condition relative to the history of their water treatment.

Over the 24 hours continuous samples of crude coal gas are taken from each of the retort benches in turn and subjected to analysis. From these tests H.E.V. values are calculated each week. Daily tests are also made by an Orsat, for the CO_2, O_2 and CO content of the mixed gas leaving each retort house. Normal analysis of producer and waste gases and the checking

of CO_2 recorders are carried out weekly. In addition, tests are made on the waste gas from each individual setting after scurfing, and before putting back to work. Such other flue gas analyses are carried out from time to time as are necessary for the effective control of the benches by the senior technical assistant. Intermittent checking of the optical pyrometers in use is made against a laboratory reference instrument, in co-operation with the technical assistants. Tests are made on average weekly samples of coal to each retort house, and sizing and proximate analyses are made of the fuel supplied to the producers and Babcock boilers; a random sample of coke extracted from one retort bench per week is also subjected to the same procedure. A check is also kept on the carbon content of weekly samples of ashes from the mechanical producers and the Babcock boiler.

Ammonia Recovery and Effluent Disposal

Recovery of ammonia is by rotary washers in the old works stream and by 'Multifilm' static washers in the new stream, where 'George,' the Holmes automatic water controller, regulates the water flow to the washers to maintain a constant ammonia slip. This is adjusted on the basis of the daily tests. All liquor is separated from the tar and concentrated by a plant, installed by Simon Carves Ltd., to treat 45,000 gal. a day, which yields a product containing less than 1% H_2S and 25-30% NH_3, with an effluent of 0.01% free NH_3. Two separate stills, working on 20 lb. per sq. in. pass out steam, for dissociation and concentration, and a variable liquor distribution, achieve this with a high thermal efficiency. Control of this plant is by five Kent Mark 20 controllers capable of proportional, derivative and integral action. Plant operation, including washers and detarrers is controlled from the works main laboratory. Each tanker of tar sold is tested for water content, and the gallonage, calculated from weight and specific gravity, is agreed with the tar distillers. These and similar evaluations for strength and specific gravity required with C.A.L. plant are carried out in the main laboratory.

The control of the liquid purification plant is somewhat specialised and daily determinations of H_2S content of the gas are made throughout the stream to determine washer efficiencies. As well as ensuring clean gas, control aims at reducing the reagent consumption by improvements in oxidation, the suppression of wasteful side reactions, and the improvement in the quality of the product. This plant, which is the largest in the country, was chosen for the elimination of the dust unavoidable with oxide. Unfortunately, although the plant has been successful in this aim, the process has a characteristic smell rather different from the traditional gasworks smell, which has given rise to complaint from the local authorities. It has, therefore, been a priority task of the department to suggest the best ways of dealing with this problem and tests have been made on the efficiencies of water and oil washing. Information, too, has been accumulated on the efficiency of active carbon for the absorption of odour, together with such data as maximum flow rates, bed capacities, back pressure, regeneration efficiencies, etc., on which a plant might be designed. Calculations have also been made on the possibilities of utilising this effluent air for combustion on retort benches. The control of normal oxide purification, analysis of new oxide and spent oxide and sulphur product sold is also the responsibility of this laboratory. Holder waters are examined particularly at the normal 'inversion' time and treatment prescribed if necessary.

Control of Dri-Gas Plant

From the third small laboratory the tests are carried out for the control of the Dri-Gas plant. This laboratory was originally constructed for benzole distillation and evaluation, but is at present not required for this purpose because of the conversion of the oil washer to supplement the washing capacity of the dehydration plant until a large new Dri-Gas plant is installed. Oil films and dew points are regularly and carefully checked on both works and district holders.

A bench in this laboratory has been equipped with various gas service taps, which enables minor constituents of individual gas streams to be determined under optimum conditions. The Gas Referees sulphur test is also situated here and adjacent to this laboratory are two test holders in which average samples of town gas are collected daily for complete analysis. These samples are analysed in the works main laboratory building, which is in the old works office block where all proximate analyses are also carried out.

Safety precautions are another aspect of the department's functions and it is responsible for chemical testing necessary to ensure compliance with Safety Regulations. For instance a safety certificate is always required before personnel are allowed to enter closed vessels where a dangerous gas could be present and the D.S.I.R. method for detection of CO by palladosulphite tube is widely employed. This is capable of detecting CO in a concentration of less than 0.01% and with it the purging of vessels and mains is carried out under the supervision of a chemist.

The presence of toxic gases in the bottom of deep shafts in made up ground, made it necessary to post precautionary notices, and use breathing equipment following laboratory tests, which clearly showed that fatal effects could have followed if these precautions had not been taken.

When the new covered wagon tippler was installed, the old method of coal sampling from trucks during tipping, by means of a long-handled scoop was no longer practical, so an automatic device has been installed to take a continuous sample through the depth of the truck at three points during tipping. This consists of three large sampling tubes distributed across the stream of coal, where it leaves the inclined plane on which the coal falls from the truck. No labour is involved in the collection of the sample and no hold-up of the train is necessary. It is believed that this type of sampler may be unique and analyses are being made to compare the results with the B.S. methods.

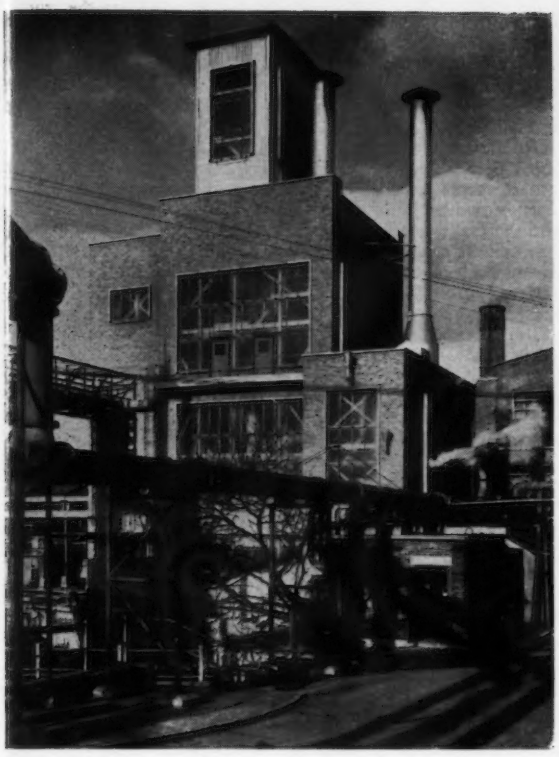
The continuous determination of small traces of H_2S in various clean gas streams has been studied, since it is obviously useful to have this information when several streams pass on to the district. Samples of gas are passed through or over lead acetate papers at a controlled rate so that the density of stain becomes an approximate measure of the H_2S concentration. The Sigma calorimeters are utilised, since the governing arrangements give exactly one cu.ft. of gas per hour and by the use of lead acetate papers in a glass bottle introduced into the supply line to the calorimeter, a quick indication is given of the comparative cleanliness of differing streams, by the inspection of the papers after similar periods, say, 24 hours. An arrangement of cocks allows the changing of papers and the purging of the bottles to be carried out without interfering with the gas supply to the instrument. By the substitution of standard glass paper holders as used in the G.L.C.C. Hollings test an actual quantitative determination may be obtained.

NEW BRITISH STANDARDS

SHEEP skin leather is used for the diaphragms of a large proportion of gas meters, particularly of the domestic type. A new British Standard (2797:1956) is based, as far as the instructions for the preparation of the leather are concerned, on the specification of the former South Metropolitan Gas Company—which had achieved wide acceptance in the industry. Additional clauses have been included which relate to performance requirements

A new edition of the British Standard for intrinsically-safe transformers primarily for bell-signalling circuits (B.S. 1538: 1956) extends the scope of the original edition to include requirements for transformers for use in applications additional to coal mining—such as factories and oil-storage depôts where there may be a risk of an explosion due to the presence of inflammable gases and vapours. The standard applies only to single-phase, double-wound transformers for supplying circuits which are required to be intrinsically-safe as defined in B.S. 1259, 'Intrinsically-safe electrical apparatus and circuits.' Comprehensive design data and details of the constructional and test requirements are included in the specification and additional explanatory notes on design and information relating to the measurement of leakage inductance are included

Copies of these two standards may be obtained from the Sales Branch, British Standards Institution, 2, Park Street, London, W.1, price 3s. 6d. and 4s. respectively.



Total Gasification at Watford

THE Eastern Gas Board have installed a total gasification plant at their Watford works, which will have its capacity raised as a consequence to about 7½ mill. cu.ft. per day. The plant has been designed and installed by The Power-Gas Corporation, Ltd. The gas-making plant at present is a horizontal retort plant with an output of 4½ mill. cu.ft. per day at 620 B.Th.U. per cu.ft. which is diluted with producer gas at 120-130 B.Th.U. per cu.ft. to the declared value of 490 B.Th.U. per cu.ft. and a C.W.G. plant of 1 mill. cu.ft. per day capacity. The total output from the works is about 6.6 mill. cu.ft. per day.

The total gasification plant is designed to produce 2 mill. cu.ft. of gas per day at a calorific value of 326 B.Th.U. per cu.ft. This bituminous water gas may be carburetted which will raise the output to 2¼ mill. cu.ft. per day at a calorific value of 475 B.Th.U. per cu.ft. Gas at 326 B.Th.U. per cu.ft. will be used as a diluent for the horizontal gas instead of the producer gas. If, however, carburetted bituminous water gas is planned, it will again be necessary to rely on producer gas as a diluent.

The plant is made up of a retort-generator, carburettor, superheater, wash box and waste heat boiler, together with certain ancillary plant. The retort generator is designed to permit higher efficiencies than is possible when bituminous coal is used in a normal water gas generator. It can be easily seen that during the blow period a large amount of distillation products would be lost. It is necessary, therefore, to superimpose a retort on the water gas generator in such a way that the bituminous coal has been subjected to heat to drive off the volatile matter before it becomes part of the generator fuel bed. Once this has happened the generator behaves as in normal water gas production, with the water gas up-graded by the distillation products.

The coal used in this plant is Baddesley or Woodside from the West Midlands coal-field with a B.S. swelling index of 1½, a volatile content of 36.3%, and graded to 1-2 in., in fact, coals of ranks 700, 800 or 900 may be used. Coal is brought from Bushey in lorries and is delivered to the works. It is elevated in a Strachan and Henshaw skip hoist to a storage bunker at the top of the plant building. Before entering the top of the plant the coal passes over a vibratory dedusting screen also by Strachan and Henshaw. The feed arrangements are governed by 'tector' rods which control the opening of the main feed valve hydraulically and start up the dedusting screen automatically as is done in modern automatic coke water gas practice. The plant consumes 40 tons of coal a day.

The retort generator is a cylindrical mild steel shell lined

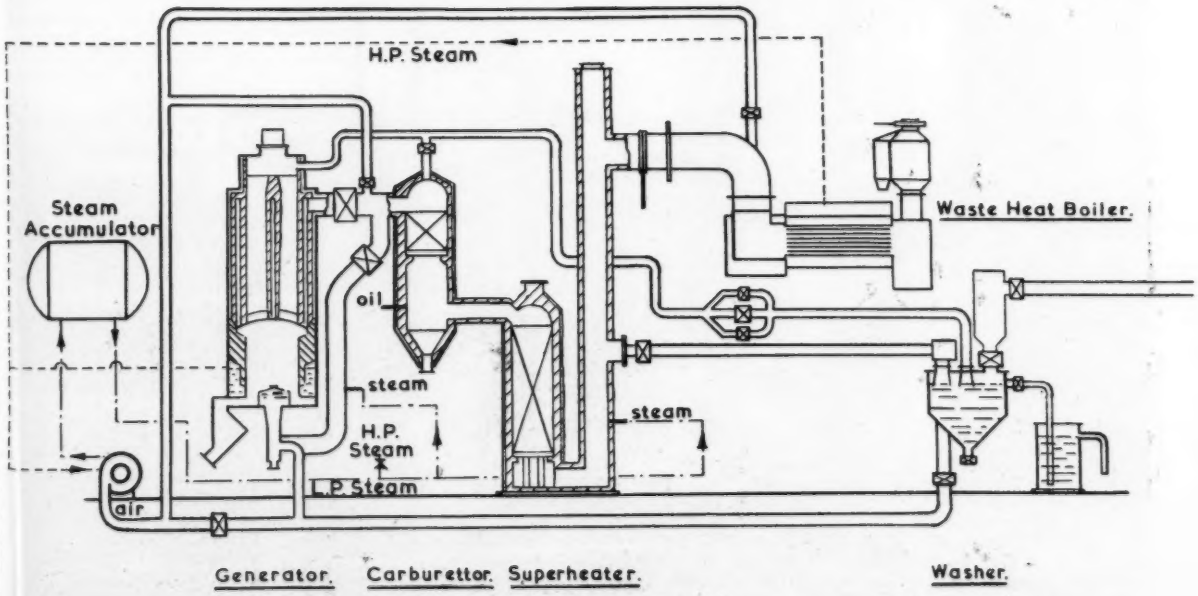
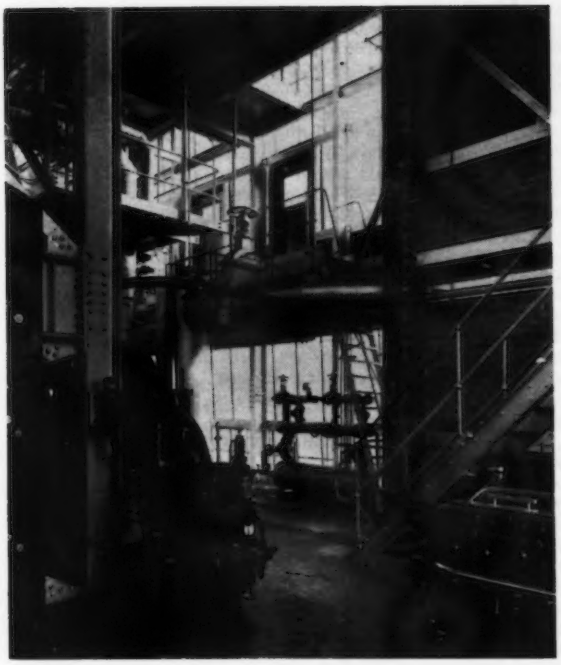


Diagram showing the general plant layout and the arrangement of the retort generator, checkerless carburettor and superheater.



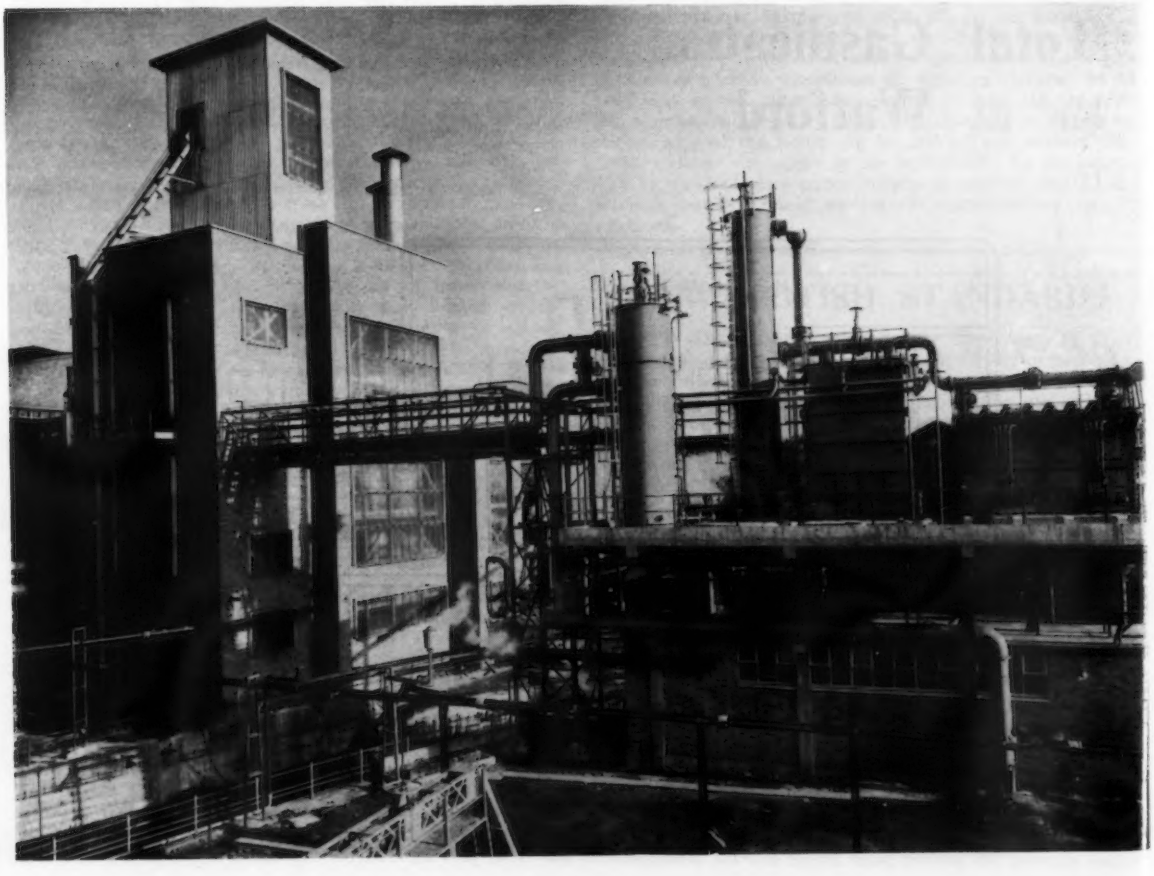
Above: *An interior shot showing the 'robot' operator and Askania governors. The effect of the large windows is clearly seen.* **Below:** *A general view, including the ancillary plant with the exhauster house below.*

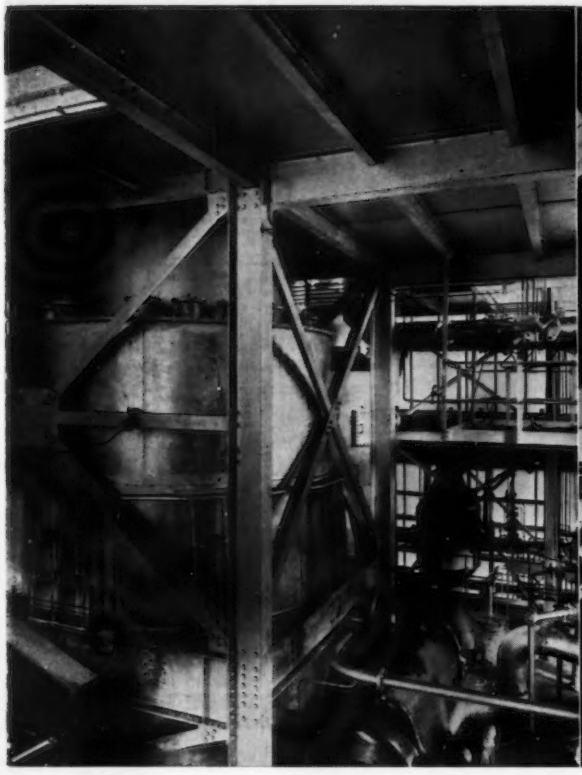
with refractory brickwork, except for a lower part of the true water gas generator which incorporates an annular boiler, in which steam is raised at 120 lb. per sq. in. The generator is fitted with a dry base which allows higher blast pressures to be used and thereby increases flexibility in output and grading of fuel.

To ensure the uniform heating of the coal charge in the upper part of the retort generator, the retort section is divided into segments with walls radiating from a central pier which is supported on a refractory arch. The annular flue is built into the walls of the retort, through which the blow gases will pass, and helps to maintain satisfactory conditions for the downward movement through the retort, while the fuel is uniformly fed into the top of the retort by an automatic charger.

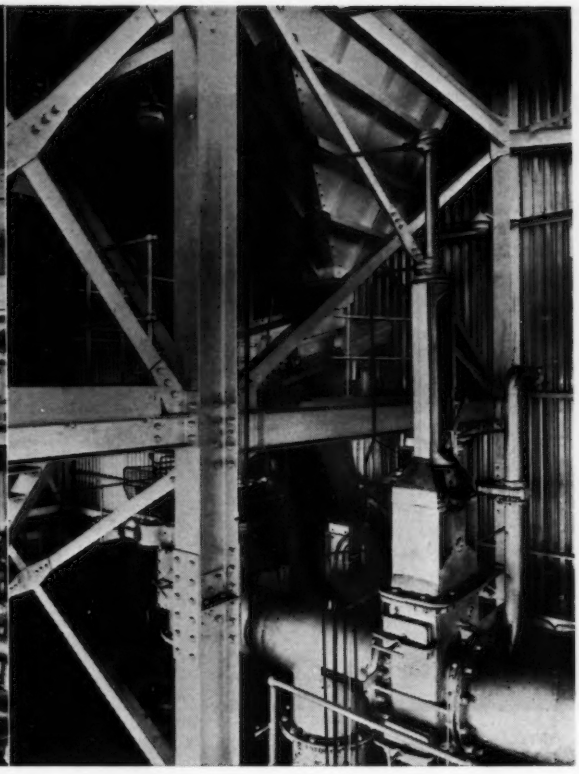
The general operation of the plant conforms to normal cyclic practice where, during the 'blow' period, secondary air is admitted to burn a portion of the 'blow gases' in the top of the carburettor and tertiary air admitted to burn the remainder before the waste-heat boiler. The hot gases will then pass on to the stack giving up their sensible heat to the waste heat boiler on the way. The distillation gases formed in the retort during the period are taken independently to the wash box, the valve admitting these gases to the top of the carburettor having been closed. After the 'blow' there is a short steam purge before the stack valve is closed and the 'make' begins. As in normal water gas practice the 'make' can be divided into 'uprun' and 'backrun.' During the 'backrun' steam flows through the superheater and carburettor to enter the generator through the 'blow' gas jacket. Most of this steam will pass downwards through the coke bed, but part can flow upwards through the retort and direct to the wash box.

All steam for power purposes is generated at 120 lb. per sq. in. in the packet boiler and the waste heat boiler. This steam will be used to drive the turbo-blower supplying blast to the generator and any auxiliary pumping equipment there





Middle section of the gas generator with the steam accumulator on the floor below. The arrangement of plant and pipework gives easy access in case of breakdown.



Top stage showing the fuel bunker and screen. At the back can be seen the temporary cladding by corrugated aluminium sheeting to allow for possible future extension.

may be which will pass out exhaust steam at 25 lb. per sq. in. into a steam accumulator from which process steam is taken.

Two Askania governor valves are, however, provided in the low-pressure system, one of which is a reducing valve to allow further quantities of high pressure steam to be used in the low-pressure system and the other a relief valve to act as an adjustable safety valve.

The plant is operated hydraulically throughout by oil pressure controlled by the conventional 'robot' operator normally fitted to their water gas plants by The Power-Gas Corporation, Ltd., with the normal protection fitted that if any fault develops in the operating mechanism the condition of the plant reverts to 'stand by.' The plant is equipped with an automatic central lubrication system by which predetermined quantities of lubricant are pumped electrically under pressure to selected points. A separate system operates the grease seal and the moving parts of the grate. All explosion discs are made of alumination sheet. Provision is also made for preheating heavy oil if it is used for carburetting.

The gas after leaving the wash-box passes to the ancillary plant from which it enters an existing spirally-guided relief holder of 800,000 cu.ft. capacity.

Simplifying Gas Vent Design

As a result of research undertaken by the Stanford Research Institute, of Stanford, Cal., U.S.A., the design of vents for gas-burning appliances has been simplified for the industry. At the request of the William Wallace Company, of Belmont, Cal., S.R.I. studied an equation for describing the operation of such vents developed by the firm's President, Alan Kinkead, and modified it to account for heat transfer factors. Following the American Gas Association's description of it as 'the most flexible and general equation yet developed for this purpose,' it has been accepted by the American industry.

During the research programme, S.R.I. chemical engineers analysed fluid flow and heat transfer in vent pipes. They also built and tested about 100 separate venting systems and experimented with various pipe diameters and lengths, as well as with materials with different heat-loss characteristics. They also recently completed a study of the behaviour of exhaust gases two appliances with a common vent.

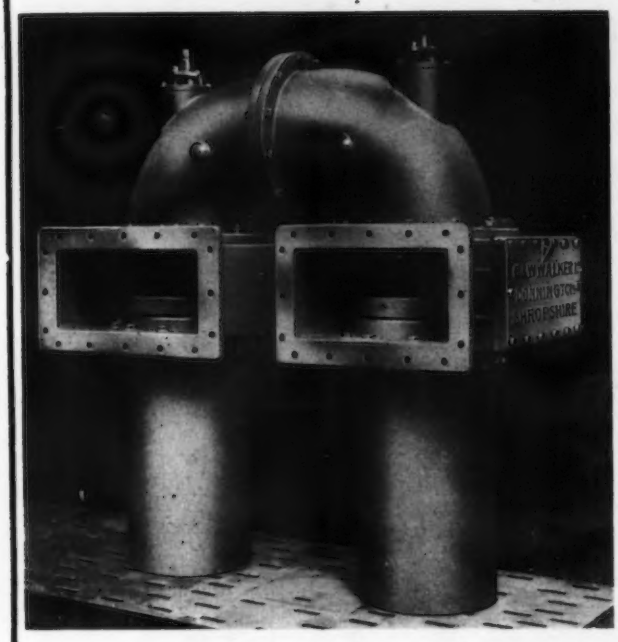
Following the successful initial research project, the gas vent-making firm has developed a simplified means, in tabular form, of correctly sizing vents for specific uses. The tables correlate an appliance's B.Th.U. output, vent height, and lateral vent length to vent diameter.

Gases rise through vent pipes by natural convection, whereby light exhaust gases are floated upward by heavier air. When the B.Th.U. output is stepped up the volume of vent gases likewise increases. If further increases produce more gases than the vent can carry off, the gases spill back into the room and capacity can be improved only by making the vent higher.

Conversely, as gases flow up vents they cool as heat is dissipated through the vent walls. If the vent is too high, the gases may become too cool and the draught is weakened. A smaller diameter or lower vent height can create improved draught and forestall condensation of combustion products to moisture or acids. The capacity range is also affected by two other factors. It increases with a decrease in the percentage of lateral run and with a drop in the degree of circulation.

Coal Price Structure

To help coal consumers to understand the basis on which prices are fixed by the National Coal Board, the Federation of British Industries has issued a third edition of its handbook, 'Coal: The Price Structure,' taking into account the various price changes which have occurred since the handbook was first issued in June, 1952.



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Some technical aspects of the gas industry in

AMERICA

FROM A PAPER TO A JOINT MEETING OF THE NORTH OF ENGLAND SECTION, I.G.E., AND THE NORTHERN JUNIORS, ON NOVEMBER 8

By W. R. GARRETT

A.M.I.C.E., M.I.Struct.E., M.Inst.Gas E., M.Inst.Welding.

GENERALLY speaking, manufactured gas as we know it in this country is fast disappearing in America. The American gas industry is placing more and more reliance on natural gas, so that distribution, service, and the selling side of gas supply is far more in evidence than it is here, though particular care is taken with regard to the composition and cleanliness of the distributed gas, especially when this is a mixture of gases. In Chicago and Pittsburgh, where the supply is entirely natural gas, the composition and calorific value are more or less fixed and here the main problem that arises is the important one of storage to meet peak load demands. In Pittsburgh for instance three gas companies supply the City, with a population about 1 mill., and one of them, the Equitable Co., sends out on a maximum day, some 407 mill. cu.ft. of gas with a calorific value of 1,050 B.Th.U. per cu.ft. The maximum send out is over 20 mill. cu.ft. per hour.

The author visited America in 1955 as a delegate to the 6th International Gas Conference at New York.

American Gasworks

The Philadelphia gasworks (station 'A'), with 350 employees, is owned by the city under the management of the United Gas Improvement Co., and is operated by the Philadelphia Gas-works Division of that Company (total employees 3,400). The population of metropolitan Philadelphia is just over 2 mill., with 533,000 domestic, and 31,000 industrial and commercial consumers. Over 95% of the Philadelphia families use gas for cooking (660,000 cookers), 80% use gas for water heating (415,000 water heaters of which 310,000 are the automatic storage type), and 150,000 homes are heated by gas. Including gas refrigerators and gas clothes dryers there are some two mill. appliances serving the area. Of the restaurants, hotels, etc., 99% use gas for cooking and commercial gas sales have increased by 59% in the last 15 years. Industrial gas sales have increased by 243% in 15 years. Since 1948, natural gas from the 'big and little inch' pipe lines which start at Texas 1,500 miles from Philadelphia, have been supplying from 85% to 90% of the total gas requirements. The natural gas is mixed with other gases and distributed as 720 B.Th.U. per cu.ft. gas. All appliances irrespective of where purchased are serviced free by some 450 trained service men and two way radio is in operation to speed up this service. The sales service is promoted by cooking demonstrations and co-operation with some 700 display dealers and 1,500 master plumbers on the display and advertising side, which is co-ordinated by the Gas Company with the appliance manufacturers and wholesalers.

The maximum day's output from this station is 168 mill. cu.ft. of 720 B.Th.U. per cu.ft. gas, with a maximum hourly rate of 7.93 mill. cu. ft. The normal gas of 720 B.Th.U. per cu.ft. delivered from this station is a mixture of:

Catalytically reformed natural gas of 280 B.Th.U. per cu.ft., coke oven gas of 530 B.Th.U. per cu.ft., air—natural gas of 720 B.Th.U. per cu.ft., and natural gas enrichment of 1,040 B.Th.U. per cu.ft.

As the load increases the following are added in the order given:

Hall oil gas from high carbon low cost oil, C.W.G. from a similar oil, catalytically reformed kerosene, and liquid petroleum gas (butane).

For peak load conditions a more expensive low carbon oil is used for the production of Hall oil gas and C.W.G.

Generally, although much of the plant was old it was well maintained. One item of special interest was to see oil-hydraulically operated inlet and outlet valves on a recently installed turbine driven axial flow exhauster, which had a capacity of 3 mill. cu.ft. per hour with 70 in. W.G. differential pressure. The date when any piece of plant was last painted is stencilled on the equipment together with identification of the pain used. In the past this station operated with steam boiler pressures of 120 lb. per sq. in. gauge but in 1950 a boiler with natural gas or oil firing was installed having a capacity of 60,000 lb. of steam per hour and a working pressure of 625 lb. per sq. in. gauge. Steam from the new boiler is used on the exhauster mentioned above and also on a turbine driven compressor and is passed out at 125 lb. per sq. in gauge for driving other prime movers. Both exhauster (680 H.P.) and compressor (1,775 H.P.) are operated on base load.

Gas mixing is on similar lines to that adopted recently at our Redheugh Works. The various gases are mixed in a 6 ft. tube some 180 ft. long before passing to the storage holders. Correction for final C.V. is made with natural gas (1,040 B.Th.U. per cu.ft.) and is controlled by a Thomas calorimeter which operates on the mixed gases. The Thomas calorimeter supervises a 'calorimixer' which controls one of two motorised butterfly valves on the natural gas line. Particular care is taken of the composition of the gas and its flame characteristics before it is allowed to pass to the district. Humidification is used to control dust and nitric oxide analysers are used continuously. Naphthalene is normally well below one grain per 100 cu.ft. Total sulphur permitted is 30 grains per 100 cu.ft. but the usual amount is two grains per 100 cu.ft. The specific gravity of the gas 0.678.

Butane (and sometimes propane) is stored as an emergency measure against interruption of natural gas supplies and is used to a limited extent for peak shaving on the coldest days. It is stored in 26 horizontal tanks each 9 ft. in diameter by 67 ft. long which can hold 717,000 gal. of butane. Men in the maintenance workshops are trained as qualified plant operators and are so assigned in periods of maximum gas demand. Safety notices were very much in evidence in this works and one in the welding maintenance workshop read: 'If you want to see, don't look.' Others were: 'Careless men never are efficient'; 'Don't take chances, others are depending on you'; 'Any fool can be careless. How about you?'

Fork lift trucks and a pallet system is used for stores and is extended for use with bricks and even awkward heavy items of equipment.

The Brooklyn Union Gas Company has two M.A.N. gas-holders of 15 and 17 mill. cu.ft. capacity. The 17 mill. cu.ft. holder is now the largest in the world since the 20 mill. cu.ft. holder at Chicago was destroyed when it was hit by an aero-

plane. One of the holders displayed a large advertisement: 'Be modern, use gas, cook, heat and cool.'

The works depends on natural, refinery, and Hall gases and butane, with a maximum day's output of approximately 250 mill. cu.ft. The send out was 160 mill. cu.ft. per day at the time of the author's visit. A cast steel valve controls the intake of natural gas which is opened by hand and closed hydraulically. Three cyclones extract the 'sand' and operations of the cock on the base of the cyclone produced a large volume of rust coloured dust. The natural gas pressure at the Hudson River is 320 lb. per sq. in. gauge and it arrives at the works at 200 lb. per sq. in. gauge. The pipe line is designed for a working pressure of 350 lb. per sq. in gauge and was tested to 475 lb. per sq. in. gauge. The line, installed in 1951 is 16 in. diameter and is a spur off the 20 in. and 24 in. pipelines which cross to New York. It has insulated joints every mile. The gas with a calorific value of 1,040 B.Th.U. per cu.ft. and a specific gravity of .60 is oderised and a deoderant 'nuturolum' is used inside control valve buildings for the benefit of operating personnel. Measurement of gas is normally carried out by three orifice meters with one check orifice meter in addition. Valves are of the Nordstrom type. Oil fogging at the rate of half a gal. per mill. cu.ft. and humidifying are necessary to reduce dust nuisance. The natural gas contains 1-1½% oxygen and the refinery gas about 6% oxygen.

Combustible Gas Alarm

In the booster house an M.S.A. combustible gas alarm is installed to give warning when the atmosphere contains 1% of gas. The instrument, manufactured by the Mini Safety Appliance Co., Pittsburgh, Pa., will give this warning within ten seconds. Cutler Hammer Calorimeters (Thomas type) were used throughout all works visited. Gum in 'send-out' gas was checked by an instrument manufactured by the Rubican Instrument Co.

The Harrison gasworks, which is in a highly industrial area with a population of some 15,000 and serves part of Northern New Jersey, has an average daily output of some 90 mill. cu.ft. of gas of 557 B.Th.U. per cu.ft. with a peak plant capacity of 286½ mill. cu.ft. per day. There are 420 technical, clerical and operating personnel, and consumers are supplied with a mixed gas from thermal cracking units (oil and natural gas), cyclic catalytic reforming units, and L.P.—air equipment (emergency and peak shaving).

Natural gas was first received in 1949 and is taken from two sources at the rate of five mill cu.ft. per hour. Liquefied Petroleum (L.P.) is stored in 24 vessels and one hortonsphere with a total capacity of about 600,000 gal. There are eight hand clinkered C.W.G. sets and one C.W.G. set with mechanical grate, all of which can also be used for thermally cracking natural gas. Three further C.W.G. sets have been modified for catalytically reforming natural gas, L.P. or kerosene.

House heating accounts for more than 50% of the gross sales and only two hours' gasholder storage is available at periods of peak demand. Weather has an important effect on load and the average winter load is four times summer load. Domestic load accounts for 70%, commercial 15%, and industrial 15% of gas supplied.

Automatic Operation

The Koppers-Hasche reformer plant at Keene is designed to provide an interchangeable gas made from butane and prior to its installation, Gas Service Inc. were distributing a carburetted water gas with a heating value of 600 B.Th.U. per cu.ft. The new gas is interchangeable with the C.W.G. although in a few instances minor burner conversions were necessary. After the first Kopper-Hasche reformer had been installed in October, 1953, the C.W.G. plant was removed and in November, 1954, a standby reformer unit was added. Later in August and September, 1955, the new plants were provided with the necessary instruments to permit automatic operation.

Butane is received in 1,000 gal. rail tanks and it is displaced by vapour compression into two storage tanks. From storage the butane passes through a vaporiser and thence at 30 lb. per sq. in. gauge to jets of the reformer where a predetermined amount of air is inspirated. The butane-air mixture flows through the heated hairpin brickwork of the reformer and thence passes to a washbox, a ring filled tower scrubber and through purifiers to the holder. Heating of the reformer is carried out by a small portion of the butane-air mixture and every 3½ minutes the direction of the butane-air mixture is reversed in the hairpin flue by an air operated four way valve. The reformer temperature was 1,330-1,440°F. and the end temperature was 590-635°F. Each reformer has a rated capacity of 1 mill. cu.ft. of gas per day and the two reformers were housed in a building about 40 ft. by 30 ft. and required a headroom of about 15 ft. The holder had a capacity of 300,000 cu.ft. and the plant operated at some 20 in. w.g. pressure which was sufficient to pass the gas through the scrubber, purifiers and into the holder. The outlet gas pressure of the reformer was 13.5 in. w.g. and the temperature outlet scrubber was 72-75°F.

The automatic instrumentation of the plant cost about $7,500 and was installed to save the wages of an operator earning $4,000 per annum. Warning was provided for low tile temperature in reformer, emergency high holder, low C.V., high C.V., low pressure vaporiser outlet, and high reformer exit gas temperature. The inspirated air flow was given as 8,200-8,500 cu.ft. per hour and the corresponding butane gas flow 4,600-5,000 cu.ft. per hour. Butane used was 6.39 U.S. gal. per 1,000 cu.ft. of make gas. The analysis of the make gas is stated to be as follows: CO_2 1.4%, O_2 0.1%, CO 8.8%, H_2 7.5%, CH_4 14.0%, C_nH_m 22.1%, N_2 46.1%. C.V. 660 B.Th.U. per cu.ft. Sp. Gr. 0.91.

In 1946 the Cambridge Gas Light Co. had three, four shell Hall gas plants which used heavy oil but because of a desire to increase the loading on the distribution system, the C.V. was increased by 80% to 951 B.Th.U. per cu.ft. and light oil was used on these four shell sets. Since then two, two shell Hall sets have been erected making five sets in all.

Operating results were given as 14.02 gal. of oil per 1,000 cu.ft. of gas of 1,000 B.Th.U. per cu.ft. or 10 therms, .70 gal. of heating oil, 4.00 gal. of tar, and .70 gal. of benzole, toluole and xylole. Propane, which is more expensive, was only used for standby duty.

The total capacity of the plant was .995 mill. cu.ft. per day of gas of 1,000 B.Th.U. per cu.ft., but it is seldom used now since natural gas costing $1.25 per ten therms has taken the place of the Hall gas.

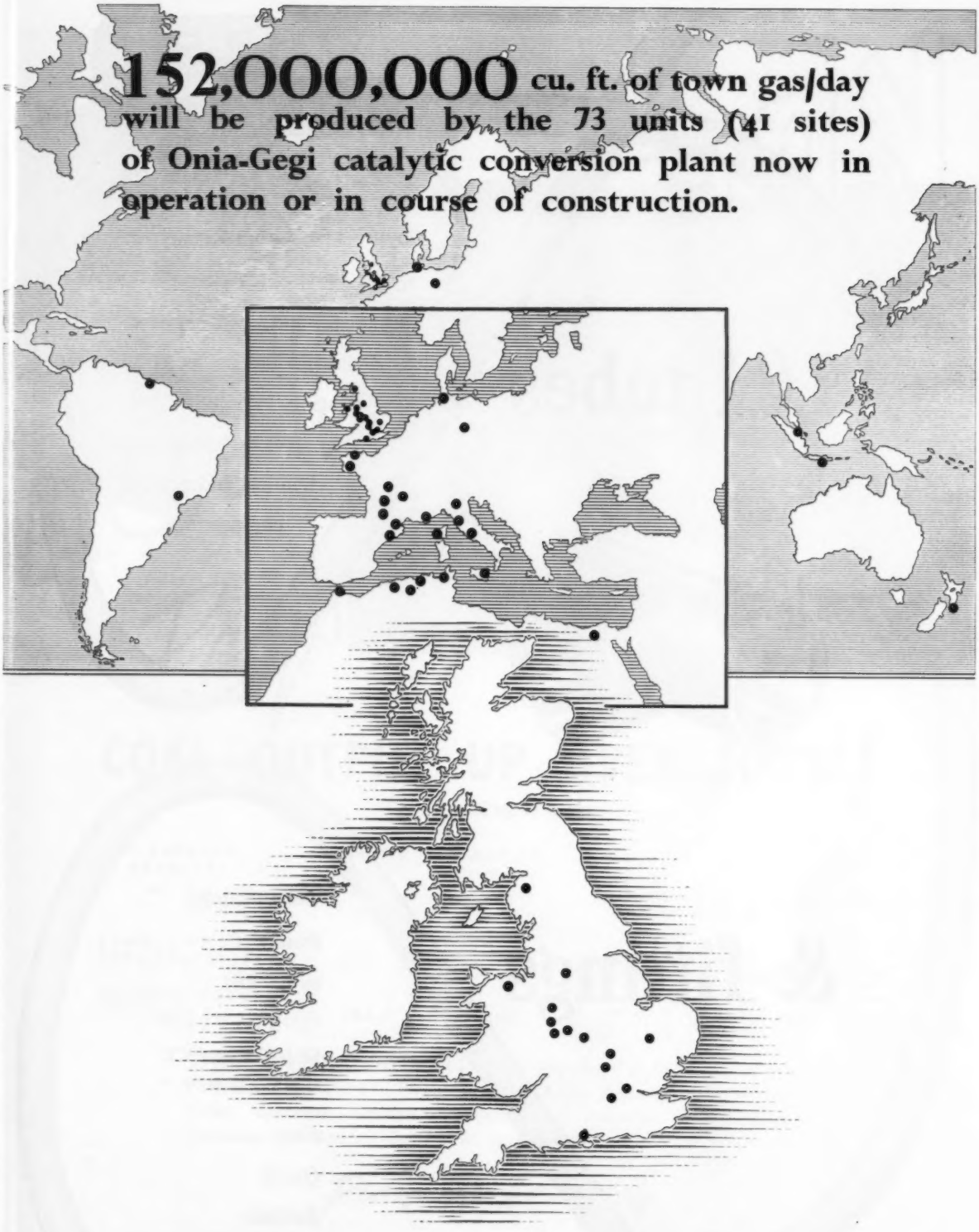
Large-scale Operation

An idea of the scale on which the American coking industry operates is given by the United Steel Corporation plant at Clairton. All coke and tar produced at this works is for steel manufacture and some 37,000 tons of coal per day are carbonised in the 23 Koppers coke oven batteries. The first installation of 13 batteries was installed in 1918 and the remaining 10 were constructed in 1920. All coal is conveyed to the site by boat and one-half of the total coal is washed. Oven heights are 10 ft., 12 ft. and 14 ft. and hold 14-23 tons of coal which is carbonised in 18 hours. There are 87 ovens in each battery and doors are self sealing. Two coals are used, one with 35% volatile matter and the other with 17%, and these are mixed in the proportions of 90% and 10% respectively.

As this is a comparatively old installation there was little of interest except the scale of operation and efforts to combat corrosion. The steelwork was being sand blasted and sprayed with a $\frac{1}{16}$ in. thick coat of black bitumastic paint, and the men on the coke plant were using plastic hoods for protection against dust.

The North Park Street gas distribution centre in the Orange-Montclair district of New Jersey is responsible for some 70,000 consumers with gas distributed at 4-6 lb. per sq. in. gauge (high pressure) through 202 governors into the L.P. network which, at maximum demand (2.0 p.m.) is 5½ in.-6 in. w.g. Previously the gas had been about 550 B.Th.U. per cu.ft., but the new supply will be 1,040 B.Th.U. per cu.ft. and meters were being installed to register therms in place of cu.ft.

On the distribution record maps, blue, red, dotted lines, etc., were used to indicate various sizes of main and three draughtsmen were employed to keep the map records up to date. Location of valves and syphons (drips) were indicated on maps and in addition a card index with yellow and blue cards respectively were also available. The back of these cards were used for the actual sketch of the location. Each house has a record card and in addition street department order cards and street and sidewalk opening cards are kept. Instructions for mainlaying are given to the foremen on special forms on which he records all details and from these forms the draughtsmen prepare records.



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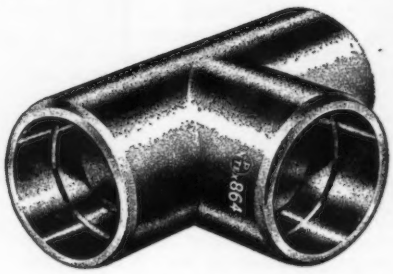

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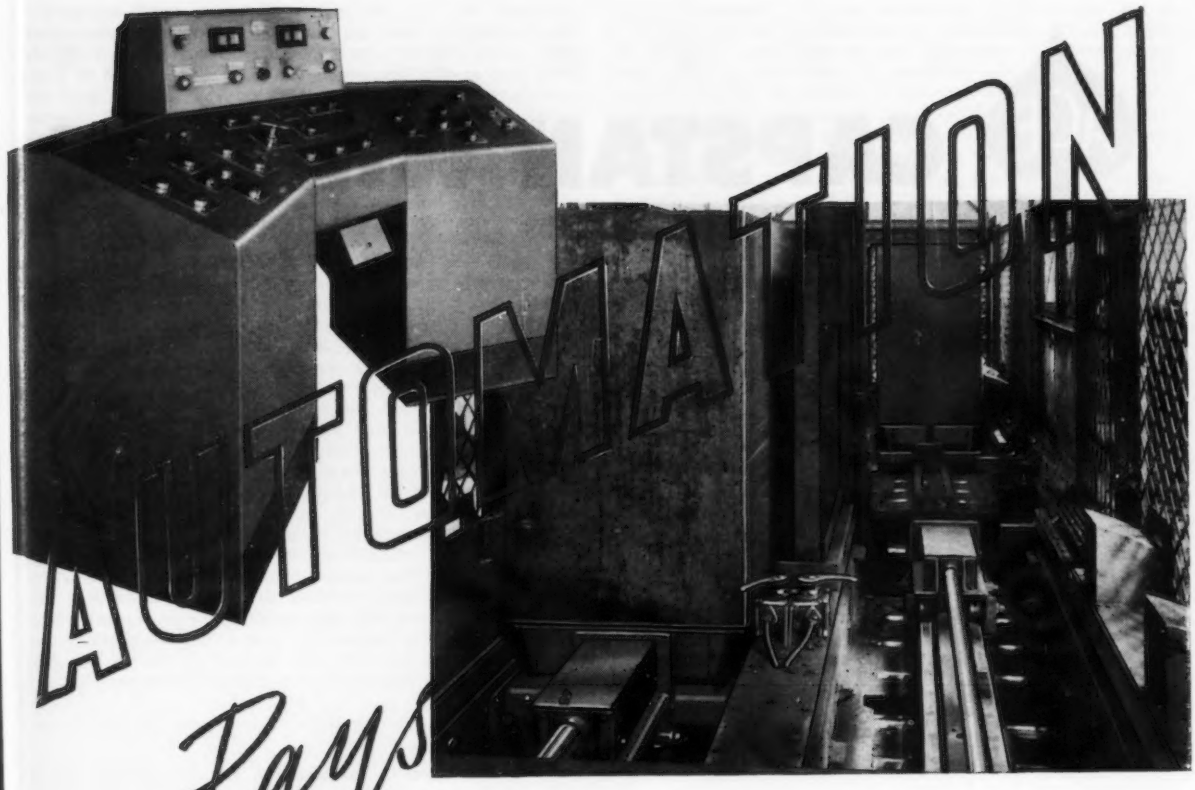

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THESE OUTSTANDING FIGURES—*reproduced by permission of the National Coal Board — illustrate the economy and efficiency of the Torley Container Automation powered and controlled by Keelavite Hydraulics at Rawdon Colliery in Leicestershire.*

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Fourteen clerks attend to wages, etc., for 330 fitters and mainlayers. The normal wage bill per week is approximately $25,000 (i.e., average of $76 per man). The minimum wage for a 40 hour week is $75. Labourers and helpers earn $1.49 per hour and get advancement after six months satisfactory service. Overtime is at the rate of time and a half except for holidays which is double time. Foremen earn $2.60-$2.75 per hour.

In the dispatching office (customer's service department) four men deal with complaints, leaks, etc., and give the necessary instructions to 16 radio cars and 66 small service trucks. During office hours the showrooms also transmit written messages to the dispatchers by telautograph. The dispatchers sit at the corner of a large square desk each with telephone and in the centre is a rota-bin (fairly large rotating filing system) which temporarily contains duplicate copies of all orders. On clearing up complaints, leaks, etc., the duplicate order is withdrawn from bin and stamped 'completed' and returned to the commercial office. Emergency orders—gas leaks, no gas, no hot water, etc.—are dealt with immediately by radio, and non-emergency calls, such as appliance adjustment are generally cleared within three days.

The training shop for fitters was exceptionally clean and well kept. In this shop the potential fitter is made familiar with every item that he is likely to meet on the district and fitters are periodically recalled to the shop in order that they can be acquainted with new equipment. The instructor explains how the equipment functions and how to dismantle and reassemble same. The potential fitter studies manufacturers' instruction sheets, dismantles and assembles equipment, and finally has to pass a written examination on each particular unit. It should be realised that most of the American gas operated equipment is complicated and very much tied up with electrical controls. The cost of training fitters is high, but it is looked upon by the workmen as a desirable job and there are plenty of applicants for any vacancies. On average the men employed give some 20 years' service. Clerical staff frequently apply for training in order to have an outdoor job.

Natural and manufactured gas is available in the shops for testing purposes and it was stated that it had taken them some seven years to change from manufactured to natural gas.

The Oakford Underground Storage Pool and natural gas transmission centre, near Pittsburgh, is reported as being the largest in the world and employs 30,000 H.P. to drive its compressors. It is sited adjacent to some 220-230 oil wells which were sunk in 1885 and exhausted by 1890. In 1949 the location of only 41 of these wells was known and utilisation of the wells for storage of gas thus presented a difficult problem. The storage stratum is some 100 ft. thick, has a porosity of 20% and lies 1,400 ft. below ground level. The total storage capacity is estimated to be 105,000 mill. cu.ft. of gas and this will be stored in two strata of approximately 85,000 and 20,000 mill. cu.ft. capacity. In all 338 wells are now in use and no check is possible at present on any loss of gas which may be taking place. Gas is stored at pressures varying from 450 to 1,100 lb. per sq. in. gauge.

There are two compressor buildings each housing six Cooper Bessemer compressors of 2,500 H.P. The compressors can give a maximum pressure of 1,500 lb. per sq. in., and normally lift the line pressure from 450 to 850 lb. per sq. in. A pressure of 850 lb. per sq. in. gauge is sufficient for the present transmission of gas, but the line pressure can be increased to 1,100 lb. per sq. in. gauge in the future. Operation of valves is by hydraulic cylinders using oil. In addition to the compressors the station has two boilers and three gas engine generators of 1,100 kW.

From a paper to the Manchester District Junior Association of Gas Engineers, Birkenhead, November 7, 1956

Industrial Gas in Wirral

By H. C. ELLES, Assoc.M.Inst.Gas E.

GROUP INDUSTRIAL GAS ENGINEER (WIRRAL GROUP), N.W.G.B.

THE industrial gas load has been recognised since the early 30's as valuable to the gas industry, so much so that incentives to its development were provided in the form of reducing tariffs for increasing consumptions and the establishment of industrial centres with specialist staffs for the development of industrial appliances. The costs to the undertaking of these incentives were balanced by the lower cost of supplying large consumers, some of whom by continuous consumption would improve the production and distribution load factors, while the cost of metering, billing and maintenance of appliances would be much less for one large consumer than for the domestic equivalent load.

The mutual advantages of industrial gas to consumers and suppliers found increasing recognition so that sales increased steadily until the outbreak of the World War II, during which the industrial load was increased enormously, by the demands of the armaments factories coupled with the shortage of seaborne supplies of other fuels and the need to make the most efficient use of the nation's coal.

Since the end of the war, industrial sales have continued to expand in a most satisfactory manner, but despite this fact, several gas boards have redoubled their efforts to secure the industrial load, as shown by efforts to obtain skilled industrial engineers, reforming of tariffs and the introduction of special tariffs for gas supplied under special conditions. This is shown too, by the establishment of new industrial centres, and the special courses for engineers trained in other branches of engineering, and for students newly entering the industry. It would seem that the future of the industry is very dependent on industrial gas sales. Another possible reason is that the Clean Air Act is soon to become effective, when the gas industry will take its share of providing the enormous quantities of additional smokeless solid fuel required. Its production will perforce be attended by the production of a similarly enormous additional volume of town gas, the only outlet for which, beyond some inevitable increase in domestic sales, is to industry.

It is hoped that much of the new production will come from existing production plant, since optimum production rates will reduce the cost of the product, while the increased demand will increase the market value of the product. It has even been suggested in the highest circles that gas may become the by-product of coke production, in which case, a reduction in price may occur which would extend the market for gas to processes which are at the moment fired by cheaper fuels.

The first essential for the promotion of industrial gas sales is an efficient staff of engineers trained in the large scale utilisation of gas, and able to apply their knowledge to the requirements of the consumer. The personal knowledge of the engineer must be supplemented by the experience of engineers practising elsewhere. The Industrial Gas Development Committee Reports circulated as published serve well to disseminate knowledge and keep the engineers abreast of current developments. Regular meetings of the Group Industrial Engineers of the North Western Gas Board have been useful in standardising good practice throughout the Board's area, in matters both of organisation and engineering.

The author was appointed Group Industrial Gas Engineer in August, 1954, for the purpose of extending the industrial gas sales and with this end in view an organisation has been set up which today comprises a deputy group industrial engineer. two senior industrial engineers and two assistant industrial engineers.

The most usual form of contact with the consumer is in reply to the consumer's enquiry, as the industrial engineer is too continually engaged in dealing with these unsponsored enquiries to pay the regular calls to consumers so essential to sales promotion. The alert industrial engineer, however, loses no opportunity while in the consumer's premises to gain the goodwill of the consumer by being of service in some way.

Most consumers will require little persuasion to allow the visiting industrial engineer to walk around the premises if it is explained that the inspection will be of benefit to the consumer by making him familiar with gas using plant. The visitor's attention, however, should not be confined to gas fired plant, since there may be processes carried out with other fuels which might be suitable for conversion to gas at a later date if a good case can be presented for such conversion. Any notes made during the tour should be mental ones, since a notebook is always regarded with suspicion by consumers in strongly competitive trades.

It is almost invariably the case that an industrial engineer on his first visit to a consumer's plant will see some way of giving service; it may be maintenance that is required or alterations to some piece of plant, however small, which may improve efficiency, thermal or otherwise. The engineer must seize such opportunities and act quickly to see in what way he may be of service, because this is the key to the consumer and his premises thereafter, but too long a time must not be allowed to elapse between visits.

The impression of good service once made must be maintained at all times and should apply to all aspects of service, however small. There is a school of thought which suggests that the division of responsibility by the industrial and sales and service departments should be determined by the appliances instead of by the kind of premises, but this would reduce the industrial engineer's opportunities of being of service even in such trivial instances as providing new radiants for the manager's office gas fire.

The measure of success which has attended the efforts of the industrial department, as shown by the results under a later heading, is in part due to the fact that until the present organisation was set up, only two industrial engineers were operating in the Group on an Undertaking basis. These engineers were fully employed in dealing with unsponsored enquiries as received from consumers, and no system of regular visiting was in operation.

With the increased staff, efforts have been made to visit every industrial consumer whether enquiries were made or not, to make sure that the Industrial Advice service was widely advertised. Now after two years these consumers are being visited frequently, the service which can be provided is known to the consumer, and it is certain that many of the enquiries, which now are numerous, are the direct result of this policy.

Probably the most valuable result of the regular visiting campaign is that the Board is now given the opportunity to discuss the advantages of gas relative to other fuels when consumers contemplate additions to their plants. Later on examples of installations will be described to illustrate this point, where the opportunity for discussion has resulted in sales of gas in direct competition with other fuels, oil in particular.

Competition

In Wirral, except in processes such as central heating and small scale baking, there appears to be little threat to existing or potential industrial gas loads from coal, coke or electricity. Fuel oil is, however, with its low basic price under the inner zone conditions prevailing in Wirral, a more formidable opponent, and many consumers are weighing carefully the advantage of low fuel cost against the inherent advantages of town gas.

Liquid petroleum gases were until recently, not to be reckoned with as competitive substitutes for town gas, since their high price prohibited their use for industrial purposes, except in cases where their use would avoid high capital outlay for long gas supplies. These gases were, and are, available under various proprietary names as mixtures of a number of liquefiable fractions which for several reasons are not suitable for bulk delivery and storage. A new service is now available, however, which offers delivery of fairly pure gases such as butane or propane in minimum lots of four tons at a price competitive with town gas. One potential consumer of 300,000 therms per annum, mainly for paint stoving, has recently decided to install equipment for butane storage having been quoted a price of £25 per ton delivered for this fuel. Since most of the paint to be treated is pure white, the lower sulphur content of butane is another advantage to be added to the price advantage.

In many instances later quoted, gas has held its own in competition with other fuels, and the position at the moment is reasonably satisfactory. There is, however, no reason for complacency since the full weight of competition has not yet been felt. The gas industry is fortunate in having built up over the past 25 years a force of engineers especially trained to deal with problems connected with the large scale utilisation of gas. The oil industry is now in the initial stages of building up a similar force, and so far the general standard of advice to consumers on oil utilisation is far from satisfactory, with the result that many consumers at the moment prefer to use gas with the advisory service that goes with it, rather than carry out their own experiments in the use of liquid fuels. The industrial engineer will enjoy this state of affairs to a lessening degree as expert advice becomes more available to the potential consumer of oil products.

Results

New orders obtained for installations in industrial premises in the two years ended September, 1956, total 1.081 mill. therms per annum of additional estimated load. In addition, large scale installations in commercial and domestic premises dealt with by the industrial department in the same period total 451,000 therms per annum. At the same time, loads reported as lost total 88,000 therms per annum, mainly for commercial central heating converted to fuel oil firing. The effect of these new loads being connected is shown by the following figures of actual industrial gas sales:

Year ending March,			1954	...	2.689	mill. therms.
"	"	"	1955	...	3.241	" "
"	"	"	1956	...	3.737	" "

During the period the paper covers, three new galvanising plants have been installed in Wirral, and for two of these where the Board were given the opportunity of taking part in the initial discussions on the choice of fuel, gas was selected and gas fired settings have been installed. Unfortunately, in the short time that each of the settings has been in operation, no figures of gas consumption per ton of product are available, but details of the installations are given below.

The first galvanising plant was installed by a Chester firm, manufacturing steel window frames, who already uses a considerable quantity of gas for other purposes. The order was obtained in the face of competition by oil, but the deciding factor was the information from the makers of the setting, Thompson Bros. (Bilston), Ltd., that some other gas fired settings of their design had lasted eight years without pot replacement, a considerably longer life than could be expected from an oil-fired setting.

The second plant was installed at a factory for manufacturing patent roofing materials which already were large users of gas for galvanising and other processes. The Board were fortunate in being invited to make proposals for a second setting for continuous metal coating of steel strip. Particular regard was to be paid to improve on the existing setting in matters such as pot life, facilities for examination of the pot *in situ*, facilities for dealing with spelter in the event of pot leakage, temperature and draught control, insulation of setting and thermal efficiency.

A firm engaged on the production of laminations for small electrical components, mainly for radio and television work, has recently installed plant for the heat treatment of the laminations after stamping. This plant consists of three bases, with one 'top hat' type portable furnace supplied with purge gas from an inert atmosphere generator, and the main process carried out in the plant is the magnetic annealing and stress relieving of laminations, with the oxidised finish obtained which is desirable as an insulating medium.

The use of gas for space heating in industrial premises has long been a source of revenue from installations employing indirect means of low pressure steam or hot water heating and more recently the direct means of high and low temperature radiant panels and unit air heaters. This change from indirect to direct means of heating is so nearly complete that

an order for a really large scale indirect gas fired heating installation is now rare. This is because of the comparative fuel costs. Where indirect heating is desired, a cheaper fuel than gas is used, and where gas is used, the utmost thermal efficiency is desired, making the use of direct methods necessary. In this gas has been very successful in competing with cheaper fuels, because it is probably the cheapest permissible means of generating heat on a large scale for space heating by direct methods, since electricity and the only type of liquid fuel suitable for flueless heating, are both dearer. Information recently received, however, indicates that liquid petroleum gas may soon prove to be competitive where the installation is large enough to justify deliveries of four ton loads.

Advantage, too, has been taken of various makes of radiant heater employing the low pressure surface combustion burner, particularly those designed for horizontal downward radiation. These heaters are particularly well suited for heating such premises as constructional engineering workshops or similar premises where heavy work is carried out in wide spaces covered entirely by overhead travelling cranes. By careful choice from a variety of types and by careful spacing of the heaters located above the crane track, an evenness of heating at floor level may now be made possible.

One installation comprises 15, 6-burner units mounted at a height of 25 ft. in a tin-printing shop, and thermostatically controlled by three electric room thermostats each of which acts on a batch of five heaters; they are fitted with individual solenoid valves, while each heater is capable of separate control by tumbler switch. One part of the shop contains the machinery for the lithographic coating of steel sheets, and it was important that the temperature of these machines should be kept reasonably constant. This the gas heaters did without difficulty, and so maintained the rubber coated rollers in a proper state of plasticity. This thermostatic control undoubtedly reduced the cost of heating, and helped to obtain this order in the face of competition from oil. This was the first installation in a factory which now uses 256 burners in various sizes of low pressure surface combustion space heaters which represents an additional load of 40,000 therms per annum. Air heaters through the works which are supplied by steam from oil fired boilers, are being replaced by this type of heating. with an additional potential load for heating of some 100,000 therms per annum.

Total sales in the group of all types of radiant heaters in the past two years amount to 717 which is estimated to represent additional annual sales of 150,000 therms. The advantages of this form of heating in factories are becoming increasingly recognised by industrialists who realise how very important is the comfort of their workpeople. Provided that the problems created by an increase in this type of load do not overtax the flexibility of production plant and distribution systems, this is a promising source of increased load.

A great deal has been done in recent years to encourage industrialists to use gas. The comprehensive interlinkage scheme throughout the Board's area, has made gas supplies more readily and reliably available, and the improvement in the advice on utilisation problems has been made possible by the appointment of additional trained industrial engineers. The education scheme for the training of future engineers, the introduction of special agreements for gas supply, and the opening of the new Manchester Development Centre, have also contributed. The industrial engineer has taken advantage of these improvements to increase the industrial gas load, but the use of gas could be extended to an even wider field by a greater purity of gas, with especial reference to sulphur compounds and a revision of the conditions under which Special Agreements for Gas supply may be granted. These Agreements, as they stand, are sometimes far from promotional in their effect on gas sales, and in some cases are actively deterrent to consumers who are careful to see that any additional usage will not adversely affect their load factors. Some relaxation of the conditions may now be possible since the Board's interlinkage scheme is almost fully operational.

DISCUSSION

Mr. D. K. Hooper, Group Industrial Engineer, St. Helens, said that industrial gas only received attention in the 1930's. though the earliest reference to it was in 1815, the year of Waterloo, when a London printer was described as replacing his charcoal heaters for plate heating by ten Cockspur burners. Dr. C. M. Walter, who was appointed by the Birmingham Corporation Gas Department in 1910 to study the industrial application of town gas, began by applying it to brass melting.

Gas was used industrially in large quantities during the first world war, when heat treatment machines replaced the batch type furnace in the old hardening shops, and after 1918 the use of gas began to increase in the glass, steel and pottery industries. In South Lancashire the use of gas in the glass industry had increased from one to more than 10 mill. therms per annum since 1936, while in the same period its use in the wire industry had gone up from about a half to 2½ mill. therms. There had been a similar trend in other industries.

Gas consumption figures for annealing furnaces illustrated very forcibly the value of loading a furnace to the maximum possible extent and showed clearly how gas consumption per ton increased as furnace load decreased.

Referring to Mr. Elles's remarks on the value of his work shop, Mr. Hooper gave an instance of a consumer who had asked for a burner with the burner head projecting for 3 ft. inside a furnace, working at a temperature of 800°C. The consumer told them their gas would backfire and, therefore, butane would have to be used. Experimental work showed that in fact an air blast could work in an ambient temperature of 940°C. under the conditions stated, without backfiring, although the mixture tube became red hot and was unable to support the weight of the burner-head. The consumer then pointed out he was dealing with glass and that town gas contained sulphur which would be detrimental to the process. Tests confirmed that that was the case and de-sulphurising plant would be necessary. Although it was proved, with an experimental de-sulphurising plant, that de-sulphurised gas could be applied satisfactorily, the customer was not prepared to purchase a plant for this purpose. He then asked whether we would be good enough to repeat the same tests for them on butane. This was done, and to everyone's delight, butane gave the biggest and best bloom so far encountered. De-sulphurised town gas is now the fuel to be used. A substantial load was thereby retained.

Mr. A. C. Clarke, Birkenhead, Mr. Elles's new deputy, confirmed his statement about over-head heaters, and that it was of particular importance that the consumer should be advised on any project involving gas or any other fuel.

Mr. H. J. Leather, Blackburn, thought Mr. Elles's figures on radiant heating were reasonable, and **Mr. J. Caste,** General Manager, Wirral Group, asked if it would be possible to combine gas and oil burners in a particular kind of furnace—using gas when it was available and oil if gas was not available. It struck him that customers would be prepared to use big quantities of gas if the prices were suitable.

Mr. Elles, in reply to Mr. Castle, said he had raised a most interesting point. There were heating furnaces in America provided for the dual purpose of using gas and oil according to the availability of oil. The question of price was a different matter, as the price of gas would have to be very low to compete with oil. The attitude, too, of the oil companies which had a block tariff was to lower the price by increasing the average intake of oil. If the price of oil went up it would, of course, affect the economics of the problem.

Mr. Hooper admitted that he was afraid of duel fuel-burners because by applying them they would prove conclusively that oil was a satisfactory fuel for the process and thereby lose the gas load permanently. If Mr. Castle had in mind the purchase of refinery gases, which would be in intermittent supply, he suggested they would have difficulty in competing with heavy oil if their price exceeded 7d. per therm, and difficulty in competing with gas oil if their prices were much in excess of 10d. per therm. Recently, however, a major consumer had asked for a quotation for the conversion of Lancashire boilers from oil to gas firing in the event of a reduction in oil supplies. Despite the fact that the customer was told that it might be impossible to supply the quantities of gas called for under those circumstances, and that the supply would be subject to direction by the Ministry of Fuel and Power, the customer insisted that he would be prepared to take a chance. When asked whether he would be prepared to take a long term load for, say, five or ten years, he was equally insistent that immediately oil became available it would be the fuel to be used on his boilers.

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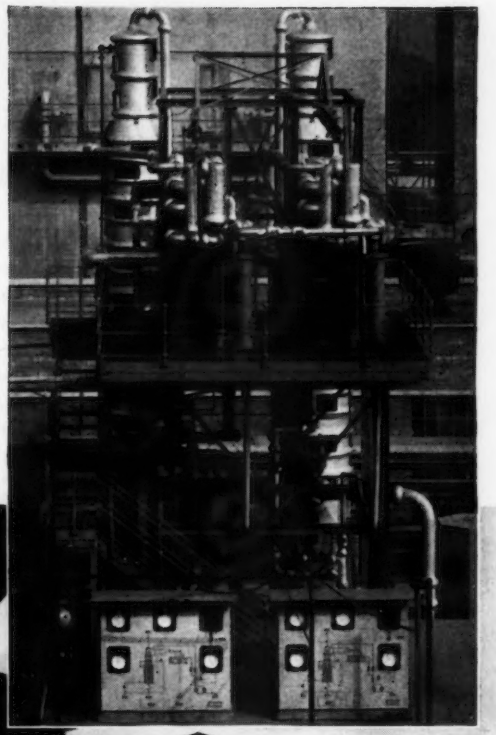

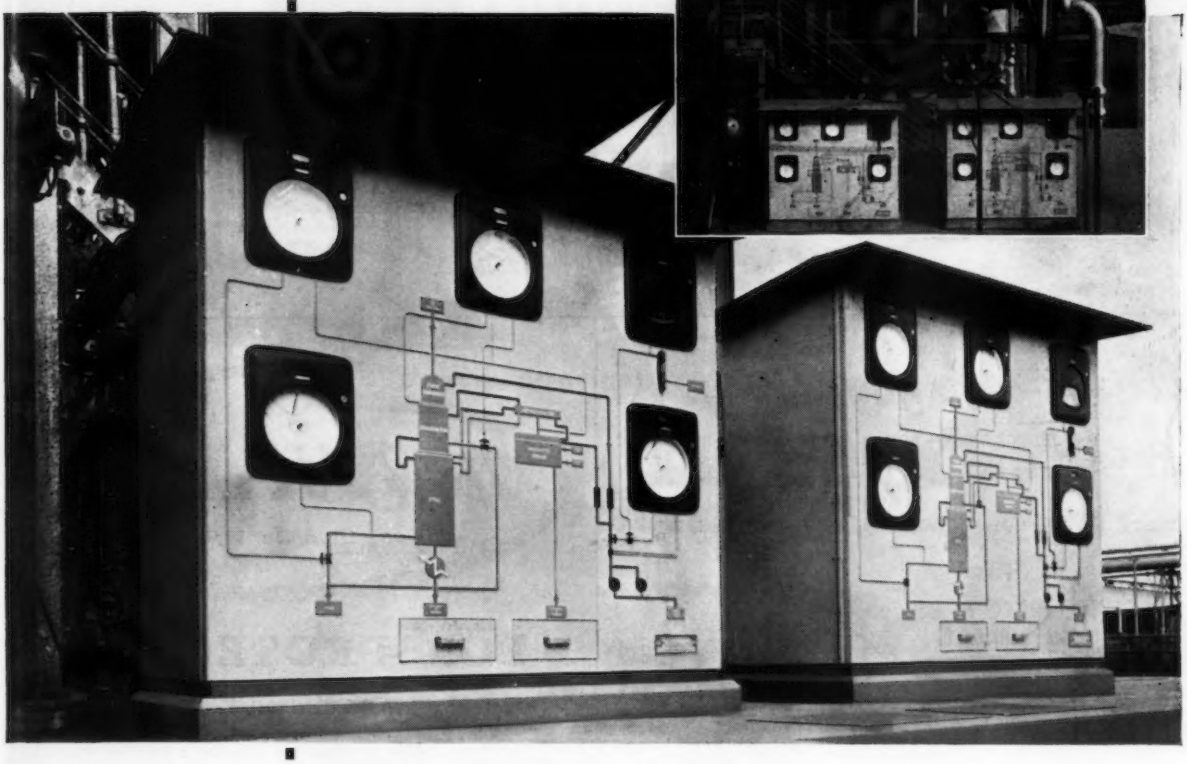

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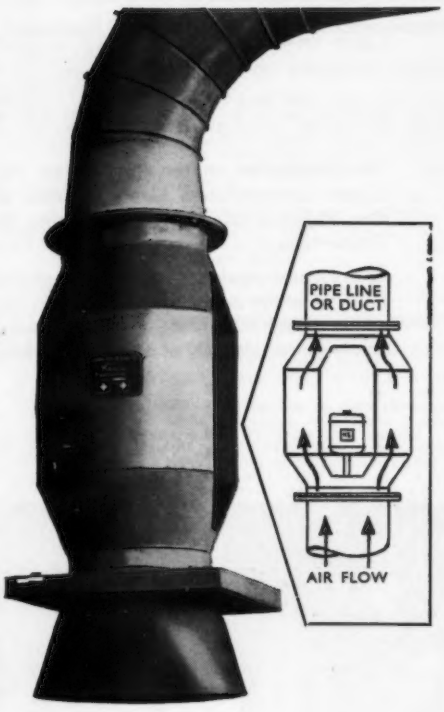

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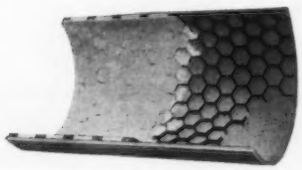

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